ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. 69. CHICAGO, SATURDAY, AUGUST 19, 1916 No. 8.

EDITORIALS

AMERICA'S ELECTRICAL WEEK.

The electrical industry, through the medium of the Society for Electrical Development, staged a unique event last winter under the name of Electrical Prosperity Week. It not only stirred the electrical industry as never before, bringing about co-operation of the elements representing central stations, manufacturers, jobbers, dealers and contractors, but it gave prominence to the use of electrical service in the eyes of the general public. Results were so satisfactory that the directors of the Society have planned a somewhat similar campaign for the present year under the name of America's Electrical Week, which is to be held December 2 to 9, 1916. Preparations have been under way for some months to make this an even greater success than the Electrical Prosperity Week last year, and the outline of these preparations which was given in last week's issue indicates that no stone is being left unturned to fulfill the expectations of the industry and concentrate the attention of the public upon the many uses to which electrical energy can be put and its possibilities for helping them in their daily work, whether it be in the home, the factory, the store or the office.

As previously announced, the prize contest for a suitable poster to be used in connection with this campaign has been completed and the judges have made their choice. The poster which has been selected is reproduced in this issue and suitably represents the magical power of electricity working as the servant of man and ready to carry out his every wish upon request.

The campaign will present an excellent opportunity for every element of the industry and every individual connected with it to impress upon the general public this same idea. The wide utility of electrical energy and the manifold ways in which it can be applied to the saving of human labor may be fully realized by those who are connected with the industry, but while the general public has a certain amount of awe and respect for this mysterious power and a large faith in its possibilities, they seldom realize to what extent it can be directly applied in their own service. The campaign will offer a means of furthering the general education of the people along this line and it should have a large commercial effect in stimulating the use of appliances and motors as well as the more obvious and universal application of electrical energy in lighting.

INTERFERENCE IN WIRELESS WORK.

If the electric waves used in radiotelegraphy were short enough to give the result of rectilinear propagation with which we are familiar in our experience with visible radiation, the problems of the wireless engineer would be on the one hand simplified, but on the other made more complicated. They would be complicated by the inherent limitation placed on the distance of transmission by the curvature of the surface of the earth. They would be simplified on account of the ease of directing the radiation to the receiving station and the prevention of a great deal of the interference which makes the identification of weak signals so difficult.

Interference may arise from other sending stations than the one whose message is being received, or from atmospheric disturbances of unknown origin, usually designated as "static." Atmospheric disturbances are irregular in character, have no definite pitch or wave-length as a rule, and are strongly damped. They cannot therefore be avoided by tuning, except in certain instances where they show a definite wave-length. They are especially prevalent in tropical regions, and when most severe may entirely interrupt long-distance communication. A direct result of static is the necessity for greater power at the transmitting station than would be necessary to send clear signals in its absence. It has been observed that interference is in many instances more troublesome when using a long wave than when using a short one, but this is not a general rule. High aerials are affected more than low ones, even when the same amount of wire is exposed, indicating that the total area exposed to the atmosphere and included in the antenna, has an influence upon the effect produced.

Various attempts have been made to entirely exclude the effects of static from the receiving apparatus, but none of the proposals so far made has met with general adoption. A form of relay for repeating radio messages over wire lines, whose invention was announced some time ago, is claimed to eliminate static entirely. Another method of elimination is suggested by the theory of electrical transmission in sectional wave conductors, which was worked out by Prof. M. I. Pupin and applied to the loading of telephone lines. This theory indicates that it is possible, by interposing a suitable conductor between the antenna and the receiving apparatus, to absorb almost completely all waves outside of a chosen range, and this range could, of course, be selected to suit the sending station. This is a selectivity of a type entirely different from that se-

cured by tuning to resonance, and it seems probable that it would be effective in repressing static.

Interference from other stations is, of course, most easily avoided by tuning and the use of a definite wavelength, different from that used by others. While this is a simple remedy when applied to a single pair of stations, it is not so feasible where general communication is required, as between ships at sea. The use of wave-lengths of 300 and 600 meters for the latter purpose, in accordance with the International Radiotelegraphic Convention, avoids interference from the powerful long-distance stations, the naval stations, and those on war vessels, all of which use a longer wave.

The introduction of the telephone as a receiving instrument, was, however, the greatest single step in overcoming trouble of all kinds from interference. This is due to a definite quality and pitch of the signals from each sending station, which can be readily distinguished by the experienced radio operator. The individual differences in sound enable the signals from one station to be recognized even when the signals from others are coming in at the same time. This is especially true when the sending station has a pure musical note of definite pitch.

A CHANCE FOR CENTRAL-STATION INITIATIVE.

In a few weeks the time will be at hand for the closing of summer hotels, many of which are at present supplied with electrical service produced in private plants of uncertain economy. In shutting down such installations for the long winter season considerable care has to be taken to protect the machinery from excessive depreciation due to dampness and general non-use, and the intelligent engineer sees to it that his equipment is well drained, cleaned and surface-coated with vaseline or some other suitable grease; that loose ends of wiring are taken up, normally covered contacts not forgotten, with piping and grates left in a condition which will allow the inauguration of service under as good conditions as possible next summer.

Cold and dampness are the two arch-enemies of the shutdown plant, and it would seem that here is a chance for the progressive central station and electrical supply dealer to step in and offer to help maintain as good stationary conditions as may be in the long months to follow the closing of purely summer establishments. Few of these hotels, cottages and country clubs can afford to operate any machinery during the long closed season, but all well conducted establishments pay at least a caretaker for his services during the cheerless months when the shutters are battened down and the hallways silent. With the development of special electric heating devices capable of taking off the chill through the application of a moderate energy consumption, the cost of supplying virtually continuous service from late fall to early spring inclusive ought not to be excessive, and the long, steady load afforded the central-station would be very desirable indeed, in cases where a service can be introduced at minimum expense. Certainly if a tiny electric coil heater pays in automobile radiator service while machines are standing days or weeks in cold garages, something of the same kind on a larger scale might well be applied to the sensitive places in summer-hotel plants.

In one large and high-priced summer hotel the laundry is located in the same building as the power plant and immediately over the boiler room is a substantial wooden tank for pure-water storage. Last winter the management tried to keep things in good condition by adding bran to the tank water, but leakage resulted, with considerable inconvenience in the boiler room. The suggestion has been made that a low-powered electric immersion heater might be installed on central-station service during the coming winter, so that the water can be kept from freezing while the tank is partially filled with liquid at all times. It may work out that a few hours' use of a battery of electric radiators daily would save many a summer-hotel plant from becoming a prey to the rust evil, and there is no question that the introduction of central-station service even on this small scale, might in appropriate cases lead to the securing of this desirable business in the following summer season.

STANDARDIZATION OF ELECTRICAL MATERIALS.

Standardization in any line of business aims at greater efficiency, decreased cost, less trouble and is for the general good of all. Standardization can be carried to an extreme where it impedes progress, by making it almost impossible to introduce or carry out improvements. When applied rationally, however, with provisions for the alteration of standards when the necessity arises, standardization is always an advantage. A good example of this is found in the standardization of the incandescent-lamp base and socket.

The Standardization Rules of the American Institute of Electrical Engineers cover such matters as rating and testing, but not construction, dimensions, etc. They are very useful in their domain, but do not cover matters which are of the greatest interest to the electrical contractor. Why should we not have standardization of much of the material used in installation work, so that the products of different manufacturers would be interchangeable?

For instance, switch boxes and flush switches should be of uniform size, so that any switch would fit in any box. The same is true of outlet boxes, of plugs, sockets and many other items used in electrical construction or in connecting up electrical appliances. Some progress has been made in this direction, it is true, but much remains to be done. Committees of the National Electric Light Association, the Electric Power Club and the Associated Manufacturers of Electrical Supplies are now working upon some of these problems, and the results of their labors are eagerly awaited.

AUTOMATIC VOLTAGE REGULATORS.

One of the slogans of the central-station industry at the present time is "service" and an endeavor is made by every progressive company to make its service just as satisfactory as possible. Moreover, state commissions are paying considerable attention to the question of service and insisting upon improvements whenever it is permitted to deteriorate beyond a certain point. One of the principal elements in good electrical service is the maintenance of voltage upon the lines without excessive fluctuations above or below the normal value.

One of the greatest helps in maintaining approximately constant voltage upon a line is the use of the automatic voltage regulator and upon alternating-current systems where long feeders are most likely to be met, the induction type of regulator seems to be generally preferred. It has proven its reliability and its capability of rendering the desired service within the limits of its capacity; and it requires no greater attention than the other apparatus located in the substation. The regulator is usually placed at the substation and adjusted with the idea of maintaining the voltage constant at the center of the load which, however, may be distributed over a considerable area. Compensation cannot, of course, be perfect because a given load near the point of compensation will have a different effect upon line drop than the same load at a distant point. Where feeders are long it may consequently be more desirable to place the regulator at the distant end of the feeder, and there are available outdoor or pole types of induction regulator which meet this need and have proven advantageous in a number of cases.

It is generally thought that the provision of good service is an expensive luxury, which is only justified in an endeavor to give greater satisfaction to the customers of a utility company. This, however, is not an entirely correct point of view, for in many cases the provision of automatic regulators actually results in a saving to the operating company. They may, for instance, make it unnecessary to increase line capacity which would otherwise be required to prevent undue drop on the line. To take a specific instance, suppose the load upon a given feeder has increased so that at the peak hours the line drop is more than can be tolerated and yet the peak load exists for such a short time that investment in additional copper to provide greater carrying capacity is not warranted from financial considerations; that is to say, additional carrying capacity is indicated for voltage maintenance, but not for energy saving. In such cases a voltage regulator will bring the voltage fluctuations within the necessary limits during the times of peak load and will be much less expensive in many cases than the provision of larger feeder capacity. In other words, satisfactory service can be maintained with automatic regulators with heavier loads than would be possible in their absence. Better regulation may consequently in some cases mean a greater earning capacity of the utility property.

INDUSTRIAL HEATING BY ELECTRICITY.

The subject of industrial heating by electricity is receiving more and more attention from central stations, as is well evidenced by the establishment of the Industrial Heating Bureau in the Commercial Section of the National Electric Light Association. Nevertheless there are probably few central-station solicitors who realize the progress that has already been made along this line and the possibilities which already exist for securing business of this character.

Technically, electric heating has passed the experimental stage, with respect to any temperature that may be desired or that can be secured by the direct application of fuel. For lower temperatures the resistance heating element is available, while for higher temperatures the electric furnace in its various forms meets every need. There are at the present time at least 60 electric furnaces used in this country for steel production, while for melting non-ferrous metals numerous small furnaces have been installed, aggregating fully 150,000 kilowatts. Only slight investigation is needed to satisfy any one as to the possibilities of electric heating on the technical side, although it is true that each new problem must be studied on its own merits, and to get the best results it must be approached from a different standpoint than if fuel were to be used as the source of heat. It is only a question of good engineering, however, to get the desired results in the best way by means of electric heating, and the only real question which may come up in individual instances is the commercial aspect of the proposition.

The commercial possibilities are far greater than are generally appreciated. For some time past wages have been high and the introduction of a process which offers savings in the labor required is usually easy. This is one of the advantages of electric heating, as much less manual labor is required in its operation than is necessary for ordinary furnaces. When this is combined with the superiority and uniformity of output which results from the close regulation of the electric furnace it becomes apparent that the cost of electric energy is not the controlling factor, but in many cases takes a very minor role. Indeed, in many small applications the use of electric energy for heating would prove profitable even at residential rates. Conditions in the future with respect to labor are likely to become even more acute, and business of this kind will not be difficult to secure.

The progressive and wide-awake new-business department will bring these facts to the attention of the possible users of electric heaters and in most cases should find it possible to take on large loads of this character. Indeed, the problem is more often likely to be one of providing sufficient capacity in the generating station to meet the demands which will be placed on its output, for this business is likely to come in large blocks. And before very long it is likely to come unsolicited, so it behooves central stations located in industrial centers to prepare.

Happenings in the Industry

American Institute Board Meeting—Jovians Anticipate Banner Convention—Municipal Electricians' Convention Program—Henry L. Doherty Candidate for Jupiter of Jovian Order—A. I. E. E. Pacific Coast Convention Program—1917 Committees of N. E. L. A. Appointed—Prize-Winning Poster Selected—Record Exports for May

American Institute Board Meeting.

The first meeting of the Board of Directors of the American Institute of Electrical Enginners for the administrative year beginning August 1, 1916, was held in New York on August 8. President H. W. Buck announced appointments on various Institute committees for the administrative year beginning August 1. The chairmen of the committees designated are as follows: Finance, J. Franklin Stevens, Philadelphia; Board of Examiners, A. S. McAllister, New York; Editing, W. I. Slichter, New York; Meetings and Papers, L. T. Robinson, Schenectady; Sections, Walter A. Hall, West Lynn, Mass.; Public Policy, Calvert Townley, New York; Development of Water Powers, John H. Finney, Washington; Patent, Ralph D. Mershon, New York; United States National Committee of International Electrotechnical Commission, C. O. Mailloux, New York. Representatives were also appointed on various joint committees and other bodies. Additional committees will be appointed later.

The Board elected from its own membership C. A. Adams, C. E. Skinner and Harold Pender, to serve upon the Edison Medal Committee for the term of two years, to fill the places of members whose terms had expired.

Upon recommendation of President Buck and the Meetings and Papers Committee, the decision previously made to hold an Institute meeting in Philadelphia in October and to omit the usual New York meeting was reaffirmed. It was also voted to hold the usual November meeting in New York, and an Institute meeting in Boston in December, omitting the New York meeting that month.

Upon the recommendation of the Board of Examiners 14 students were ordered enrolled, 102 applicants were elected as associates, 5 were elected to the grade of member, 18 were transferred to the grade of member, and 2 were transferred to the grade of fellow.

Jovians Anticipate Large Convention Attendance.

In the forthcoming issue of *The Jovian*, the official organ of the Jovian Order, much space will be devoted to pre-convention announcements. Owing to the interest aroused concerning the various administration questions to be considered, and the unusually large number of candidates announced for the various offices of the organization, there is every reason to believe the attendance at the convention at Indianapolis, Ind., October 18 to 20, will surpass that of any previous gathering of the Order.

This year an unusual amount of preparation is being made to entertain the wives, mothers, sisters and daughters of the members. The reigning head of the order, Jupiter Thomas A. Wynne, expressed an opinion upon his election at Chicago, last October, that the co-operation of the feminine relatives of the members would add greatly to the success of the convention. With this object in mind he appointed a ladies' committee, of which Mrs. Sam A. Hobson is head, composed of the wives of all the Past Jupiters, to promote the attendance of ladies. This committee has been very active, and from the assurances it gives of the social functions planned for their entertainment it is practically certain there will be a large number of ladies present.

Tentative Program for New England Section Convention.

A preliminary program of the three-day sessions of the New England Section, N. E. L. A., convention at Pittsfield, Mass., in October has been prepared and issued by Miss O. A. Bursiel, secretary.

Wednesday, October 18, will be Industrial Heating and Large Power Users' Day. There will be addresses by representatives of various industries using central-station power and a report of the Heating Research Committee.

Thursday morning, reports will be given by the Accounting Section Committee and the Public Policy Committee, and the afternoon will be given to a Public Service Commission session, at which members of the commission of various states are expected to speak. This feature was inaugurated last year.

Friday morning, a report of the Commercial Section Committee, with a half dozen separate topics discussed by leaders of the industry, will make up a valuable session. Ranges, appliances, concentric wiring, the use of Type C lamps for street lighting and store lighting, will be treated. There will be a talk by Mr. Edkins, chairman of the Commercial Section, and probably by the chairman of the Salesmen's Hand Book Committee.

A large convention is expected. President W. S. Wyman of the New England Section has been in Boston perfecting the plans.

Convention Program of International Association of Municipal Electricians.

The twenty-first annual convention of the International Association of Municipal Electricans will be held at Baltimore, Md., August 22 to 25. An attractive program, comprising a large number of papers to be presented by leading men of the electrical industry, has been prepared. A feature of the convention will be a visit to the Bureau of Standards at Washington, D. C. The delegates will inspect the institution and witness tests to be conducted for their benefit.

The convention will be called to order Tuesday morning, August 22, and the response to Mayor Preston's welcoming address will be made by Dr. C. P. Steinmetz. Following the president's address, C. W. Abbott, American Conduit Manufacturing Company, Pittsburgh, Pa., will read a paper on "Concentric Wiring." At the Tuesday afternoon session the following papers will be presented: "Wireless Interference with Signal Lines and Interior Wiring," by W. J. Canada, Bureau of Standards, Washington, D. C.; "The National Code and Its Value to Our Association," by R. A. Smith, Norfolk, Va.; "Rubber Insulation for Electrical Purposes," by Dr. Whipple, Safety Insulated Wire & Cable Company, New York, N. Y. Tuesday evening the Baltimore Section of the National Electric Light Association will give a reception to the delegates.

Dr. C. P. Steinmetz, vice-president of the association, will present a paper at the Wednesday morning session on "Electric Power and Its Value to Municipality." Frank Dix, superintendent of the municipal plant at Fort Wayne, Ind., will give a paper on "Modern Municipal Electric Plants," which will be followed by the reports of the com-

mittees on municipal lighting and on grounding. In the afternoon a boat trip down the bay will be made, the party returning in the evening.

At the Thursday morning session the following papers will be presented: "The Electrical Fire Hazard," by F. H. Moore, Indianapolis, Ind., president of the Western Association of Electrical Inspectors; "Street Signals and Traffic Warnings in Connection with Fire Apparatus," by L. S. Branch, Newark, N. J.; "Standardization," engineering department, National Lamp Works of the General Electric Company, Cleveland, O. Reports of the finance, executive and membership committees will then be made. Thursday afternoon C. I. Diehl, of Harrisburg, Pa., will read a paper on "The Fire-Alarm System," and J. W. Kelly, of Camden, N. J., one on "Police Signaling."

The Friday morning session will be occupied with reports of committees on high voltage and the National Electrical Safety Code. Dr. F. H. Snow, chief of the bureau of engineering, Public Service Commission of Pennsylvania, will present a paper on "Standard Specifications Covering the Construction at Overhead Crossings of Lines of Public Utilities in Pennslyvania." Friday afternoon Dr. J. P. Jackson, Commissioner of Labor and Industry for Pennsylvania, will give an address, to be followed by reports of committees on exhibits, publicity, electrolysis, licensing electricians, and standard construction of municipal signaling systems.

Exhibition Committee of N. E. L. A. Declares Dividend Payable to Chicago Exhibitors.

The Exhibition Committee of the National Electric Light Association met at the offices of the association on July 27 for the election of officers for the year. The members in attendance were: Chairman J. W. Perry, Frank H. Gale, S. E. Doane, J. C. McQuiston, J. Mustard and Secretary, H. G. McConnaughy. J. W. Perry, of the H. W. Johns-Manville Company, was re-elected chairman, Frank H. Gale, of the General Electric Company, treasurer, and H. G. McConnaughy, secretary.

A large amount of business was transacted by the committee but the most important item that presented itself was the agreeable surprise in store for the exhibitors at the Chicago Exhibition this year. This exhibition was one of the most beautiful and important ever given under N. E. L. A. auspices. But in spite of many expenses the committee has found that these are well within its carefully made estimates, and under these circumstances it is issuing to all the Class D members who exhibited the notification that it has decided to return to each exhibitor 15 per cent of the amount paid by him for exhibition space. This handsome dividend, which is of a kind that is exceedingly rare in such matters is due not only to the work of the committee itself, but to the hearty co-operation of the exhibitors individually and as a whole.

Program for the Pacific Coast Convention of the American Institute of Electrical Engineers.

The Pacific Coast convention will be held at the Hotel Washington, Seattle, Wash., September 5 to 9. At the opening session on Tuesday morning there will be an address by President H. W. Buck and a paper entitled "A Distributing System for Domestic Power Service from Commercial and Engineering Standpoints" by Carl H. Hoge and Edgar R. Perry. At the afternoon session there will be a paper on "Some Features of Domestic Electric Cooking and Heating" by H. B. Pierce, and one on "Temperature Rise of Insulated Lead-Covered Cables" by Richard C. Powell.

At the Wednesday morning session there will be a paper entitled "Inductive Interference as a Practical Problem," by A. H. Griswold and R. W. Mastick. At the afternoon session there will be three papers, as follows: "Testing for Defective Insulators on High-Tension Transmission Lines," by B. G. Flaherty; "The High-Voltage Potentiometer," by Harris J. Ryan; "An Artificial Transmission Line with Adjustable Line Constants," by C. E. Magnusson and S. B. Burbank.

The program for both the morning and afternoon sessions on Thursday will be supplied by the Northwest Electric Light and Power Association. At the evening session there will be lectures on "The Engineer and the Public," by Henry Suzzallo, and on "Illumination of the Panama-Pacific Exposition," by W. D'A. Ryan.

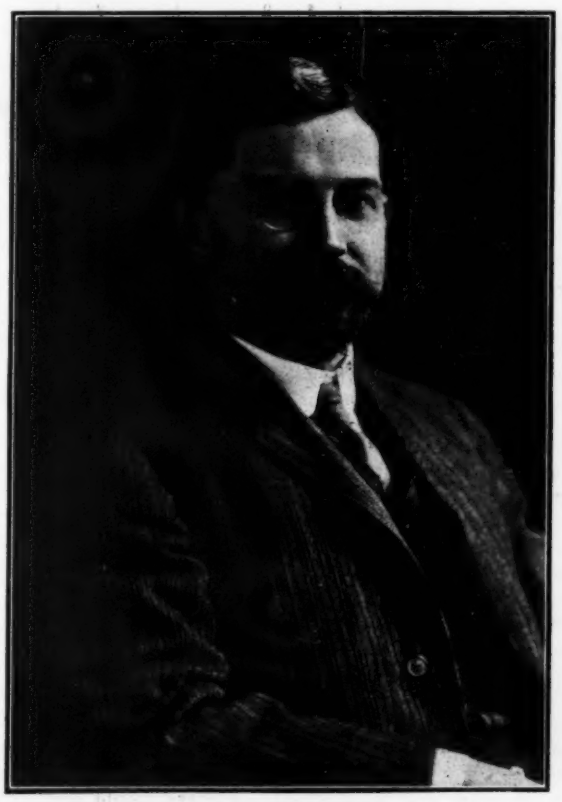
At the Friday morning session there will be two papers, entitled "Characteristics of Admittance Type of Wave-Form Standard," by Frederick Bedell, and "Insulator Failures Under Transient Voltages," by W. D. Peaslee.

In addition to the technical sessions numerous entertainment features are being arranged.

Henry L. Doherty Is Candidate for Jupiter of Jovian Order.

In response to urgent requests from prominent men in the electrical industry during the past six months, Henry L. Doherty, of New York, one of the most prominent men in the industry, has announced his candidacy for the next Jupiter of the Jovian Order.

Mr. Doherty has held high offices in many electrical organizations and is admirably fitted to direct the affairs of



Henry L. Doherty.

the Jovian Order. His election would undoubtedly add considerable influence and prestige to the organization and enable it to gain the co-operation of the influential men of the industry, even to a greater extent than before.

The annual meeting at which the election will take place will be held at Indianapolis, Ind., October 18 to 20.

1917 N. E. L. A. COMMITTEES.

Appointments Made at Executive Committee Meeting on August 4.

At the meeting of the Executive Committee of the National Elctrical Light Association, held in New York on August 4, reports were received from the chairman of the various sections and much work for the coming year was planned. It was announced that G. B. Muldaur has been appointed field assistant secretary of the Association. The appointment of A. J. Marshall as executive representative of the Commercial Section was confirmed.

Secretary Martin presented applications for membership received since the May meeting as follows: Class A, 24; Class D, 15; foreign membership, 1; Class B, 492; and Class E, 28. Four Class C members having been approved by the Class E committee, the total new members passed on at the meeting was 564. Exclusive of the membership on the Electrical Vehicle Section the membership of the national body at the time of the meeting was 14,159.

Standing Committees.

President Wagner submitted the following appointments as chairmen of committees: Public policy, W. W. Freeman, Cincinnati; committee of Class C membership applications, Walter Neumuller, New York; Pacific coast representation, R. H. Ballard, Los Angeles; finance committee, J. B. McCall, Philadelphia; committee on constitution and by-laws, R. S. Orr, Pittsburgh; committee on membership, Walter Neumuller, New York; exhibition committee, J. M. Perry, New York; transportation committee, George W. Elliott, New York; committee on Manufacturers' Section, S. E. Doane, Cleveland; committee on Doherty prize, Paul Spencer, Philadelphia; committee on Frasse prize, E. W. Lloyd, Chicago; committee on geographic sections, L. D. Gibbs, Boston; committee on company sections, F. A. Birch, Philadelphia; rate research committee, Alex Dow, Detroit; committee on safety rules and accident prevention, W. C. Eglin, Philadelphia; lamp committee, Frank W. Smith, New York; committee on progress, T. C. Martin; committee on education, John F. Gilchrist, Chicago; committee on valuation terminology, J. N. Shannahan, Newport News; committee on relations with other associations, R. S. Orr, Pittsburgh.

New Committee Work.

There were several new committees formed this year, the purposes of which were explained by President Wagner. The Pacific Coast representation committee will keep in touch with association activities generally and increase the activities on the Pacific Coast. Mr. Doane accepted chairmanship of the committee of eleven to consult the Class D manufacturing company members and advise as to ways and means of establishing a Manufacturers' Section and to decide upon the personnel of the first executive committee of the section. President Wagner reported that upon investigating the subject of valuation terminology and considering the personnel of the committee and the chairman, he had learned that practically the same ground had in a preliminary way been covered by the American Electric Railway Association and in order to avoid duplicating its work he had deemed it desirable to appoint as chairman of the committee J. N. Shannahan, vice-president of the Newport News & Hampton Railway, Gas & Electric Company, who is chairman of the American Electric Railway Association's valuation committee and whose company is a member of the National Electric Light Association. In connection with the committee on education, President Wagner advised that he had appointed Vice-President W. F. Wells of Brooklyn as chairman of a committee to be composed of the chairmen of committees and the chairmen of national sections, the object being to exchange ideas and bring about better co-operation; the committee to be known as conference of sectional and committee chairmen.

The purpose of Mr. Orr's committee dealing with other associations is to keep in touch with public service associations and report to the president and executive committee on the possibility and advisability of co-operation along lines of work in which there may be common interest.

President Wagner reported that he had called a conference of the chairmen of the Commercial and Technical Sections, because he felt that there was need for closer co-operation between these sections due to the changes that have taken place in the industry by reason of greater sales of electric energy in industrial fields, with the result that commercial men constantly encounter technical problems requiring technical knowledge. As a result of this conference, there will be an interchange of representation on the committees of the two sections. The Technical Section will have three representatives on the Commercial Section wiring committee, three on the power sales bureau, one on the lighting sales bureau, and one on the new committee on commercial service and relations with customers, while the Commercial Section will have two representatives on the Technical committee on engineering service to small companies.

Electric Vehicle Section Work.

Chairman Mansfield of the Electric Vehicle Section reported that the section is planning to carry on a campaign with the central stations, following President Wagner's example, with a view to having each company purchase one electric vehicle for use or resale. The section is also urging central stations to organize electric vehicle departments or to appoint an employee responsible for this work.

Reports were also made by Chairman E. A. Edkins for the Commercial Section, by Douglass Burnett for the chairman of the Accounting Section, and by Secretary Martin for the chairman of the Technical Section.

Commercial Section Committees.

Although all of the committees have not yet been appointed, the following list submitted by the Commercial Section was accepted by the executive committee:

Finance committee, John G. Learned, Chicago; publications committee, F. D. Pembleton, Newark; salesmen's handbook committee, R. H. Tillmann, Baltimore; wiring committee, R. S. Hale, Boston; merchandising committee, J. V. Guilfoyle, New York; committee on education of salesmen, F. R. Jenkins, Chicago; electric range committee, C. E. Michel, St. Louis; power sales bureau, George H. Jones, Chicago; lighting sales bureau, T. F. Kelly, Dayton; industrial heating bureau, H. O. Loebell, New York; commercial service and relations with customers committee, R. F. Bonsall, Baltimore; committee on co-ordinate advertising and sales campaign, Henry Harris, Pittsburgh; committee on foreign relations, E. A. Edkins, Chicago.

Electric Vehicle Section Committees.

The following chairmen of committees appointed by the Electric Vehicle Section were also indorsed:

Legislative committee, P. D. Wagoner, New York; garage and rates, C. H. Miles, Boston; federal and municipal transportation, J. H. McGraw, New York; membership, G. A. Freeman, Chicago; operating records, Robert P. Grove, New York; manufacturers and central station co-operation, George B. Foster, Chicago; standardization, E. R. Whitney, Philadelphia; traffic and good roads, A. A. Anderson, Detroit; motion picture films, Carl R. Reed, Philadelphia; insurance, Day Baker, Long Island City; constitutional revision, Frank W. Frueauff, New York.

Douglass Burnett, in the absence of John L. Bailey, chairman of the Accounting Section, read the report from that Section, together with a list of chairmen as follows: Classification of Accounts, William Schmidt, Jr.; Form of Annual Report to Commissions, George M. Moore; Customers' Records and Billing Methods, E. J. Fowler; Cost Accounting and Statistics, C. L. Campbell; Merchandise Accounting, L. T. Coleman; Stores Inventory Methods, W. E. Long; Purchasing and Storeroom Accounting, K. C. Campbell; Accounting Efficiency, D. M. Speed; Accounting Education, Alex Holme;

Accounting Service to Small Companies, Frederick Schmitt; Commission Accounting Rulings, Edwin D. Dreyfus; Membership, T. P. Wickham. The report of the Committee was unanimously accepted.

Technical Committees.

Secretary Martin, in the absence of Chairman McClelland of the Technical Section, read the report of the meeting of the Executive Committee of said Section, held July 12, accompanied by a list of committees and chairmen for same. The report dwelt upon the need of closer co-operation between the Technical and Commercial Sections in certain departments which had been brought to the attention of the two Section Chairmen by President Wagner, and stated that various steps had been taken to interlock the respective committees wherever such a plan was feasible, thus cutting down the membership of overlapping committees and the duplication of effort.

Committee on Overhead Line and Inductive Interference, chairman, H. B. Gear; Committee on Underground Construction and Electrolysis, chairman, E. B. Meyer; Committee on Prime Movers, chairman, J. M. Graves; Committee on Electrical Apparatus, chairman, J. L. Knight; Committee on Meters, chairman, C. H. Ingalls; Committee on Power Supply for Electrification of Steam Railroads, chairman, Peter Junkersfeld; Committee on Electrical Measurements, Values and Terminology, to be re-arranged by conference between Mr. McClelland and Mr. Wagner, as a Committee on Standards; National Joint Committee on Overhead and Underground Line Construction, chairman, R. J. McClelland; National Joint Committee on Electrolysis, chairman, Philip Torchio; Illuminating Engineering Committee (new); Industrial Engineering Committee (new); Electric Furnace Committee (new); Committee on Engineering Service for Small Companies (new), chairman, S. W. Borden.

On motion of Mr. Johnson, offered at the request of Mr. Mansfield, it was voted that the entire accounting and financing of the Electric Vehicle Section be taken over by the N. E. L. A., the Electric Vehicle Section to draw a check covering its present individual bank account in favor of the N. E. L. A. and hereafter the N. E. L. A. would draw all checks and assume all Electric Vehicle Section liabilities and income, and that the Electric Vehicle Section endeavor to collect all accounts receivable.

Prize-Winning Poster Selected for America's Electrical Week.

Imagine nearly 800 posters, all in colors, all by individual artists, and you have an idea of the task before the judges who recently selected the prize winners in the America's Electrical Week poster competition conducted by The Society for Electrical Development. The competition closed June 1. Over 800 posters were received, representing over $100,000 worth of designs.

The number is more than four times greater than the returns of any previous poster competition of the United States. Also, in the character of posters submitted, and the standing of the artists, the contest far exceeded all previous contests in America.

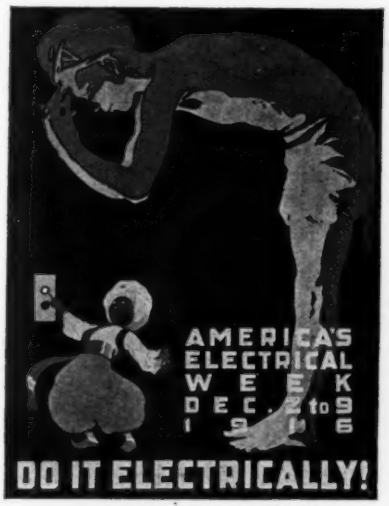
As a publicity venture, it has already exceeded expectations. In each of the cities, where the exhibit has been shown, thousands of dollars worth of space in the reading columns of newspapers and magazines have proclaimed the importance of the exhibit and its purpose. Thousands of persons saw the posters at the various exhibitions.

The main idea was to get an official poster for the week which would most appropriately depict the influences of electricity, and at the same time be a fitting design for this great national undertaking. The design had to be striking to get attention, and it had to be a design which could be faithfully reproduced in everything, from a poster stamp to a bill poster. Since America's Electrical Week will appeal alike to rich and poor, man and woman, merchant and customer, artist and engineer, everybody was asked to suggest a fitting design to drive home into every hamlet and city the message "Do It Electrically."

The judges were unanimous in their choice, which is shown herewith. In colors it is, of course, many times more effective. The judges, all recognized as representative commercial art critics, were: John Quincy Adams, secretary, Municipal Art Commission; James P. Haney, art director, New York High Schools; Herbert S. Houston, president, Associated Advertising Clubs of the World; Arthur F. Wiener, president, International Art Service; P. L. Thomson, advertising manager, Western Electric Company; Henry L. Doherty, president, Society for Electrical Development.

The poster might well be entitled, "The Modern Aladdin." Of all the Arabian Nights Tales, the story of Aladdin is perhaps the most fascinating. The all-powerful slave, who could be summoned by the mere rubbing of a mysterious lamp and the treasures thus at the command of the lamp's owner—these make a narrative that survives.

Yet the modern Aladdin, pictured in this poster, performs wonders that make the adventures of the Arabian



"The Modern Aladdin," Selected Poster Design for America's Electrical Week.

Nights hero fade into insignificance. Gone is the ancient lamp. Now it is the gentle touch of a button and forthwith comes the Genie, Electricity. He bears not precious stones but things far more precious—light, heat, power. And this wonderful Genie comes and goes, as did Aladdin's, at our bidding. He is always "at your service." The thought of America's Electrical Week, "Do It Electrically," could not be presented to the people better.

This design will be used throughout the campaign, millions of poster stamps, street car and window cards, lithographs, posters, in newspapers, magazines, etc. It will be reproduced at least 200,000,000 times.

Here is the way the competition was handled by the Society and its Poster Committee, composed of leading electrical advertising and sales managers. Printed announcements with conditions and rules were distributed to every professional artist whose name was available. Copies of the announcement were sent to more than 3,000 high schools in the United States and to more than 1,500 institutions where industrial art or drawing is a special branch of study. Hundreds of art clubs, libraries and students' leagues posted these announcements for the information of members.

The posters were assembled for the inspection of the judges on June 10 in the Anderson Galleries, New York City. The judges were instructed to determine the follow-

ing prize-winning posters: $1,000 grand prize; $500 second prize; $200 art student's prize; $100 first high school prize; $50 second high school prize; $25 third high school prize; $15 fourth high school prize; $10 fifth high school prize. The judges were further instructed to select those posters which should be classified as eligible for the public vote to decide the winner of the $300 public choice prize. The Society exercised no influence upon the determination of the prizes and left the decision of the awards exclusively to the judges.

After many deliberations, the judges eliminated all posters not entitled to be considered for the public choice prize. Some 125 posters survived this test. The judges then determined the winners of all of the prizes except the public choice prize.

The prize winners were then voted on as follows: First or grand prize—Harold von Schmidt, San Francisco, Cal. Second prize—John A. Bazant, Bronx, N. Y. Art student's prize—Edward Staloff, Jersey City, N. J. First school prize—Harold H. Kolb, Sommerville, Mass. Second school prize—Wm. E. McKee, Jr., Hollywood, Cal. Third school prize—Armand Moreda, Brooklyn, N. Y. Fourth school prize—Ruth M. Jameson, Buffalo, N. Y. Fifth school prize—Edna E. Crowley, Chicago, Ill. This decision made the poster entered by Harold von Schmidt the official design for America's Electrical Week. The public choice prize of $300 was awarded to Vincent Aderente, of New York City. This was determined by the highest total of votes registered by the public attending the exhibition of posters at New York City, Philadelphia, Atlantic City, Chicago and Milwaukee. The Society will issue, about August 22, an attractive booklet showing in colors the best posters submitted.

Chicago Electrical Outing Successful.

Despite several varieties of weather, mostly disagreeable, the annual outing of the Electric Club-Jovian League of Chicago, which was given at Ravinia Park, Ill., on August 10, was on the whole quite successful. It was attended by over 700, including the families and friends of members, this being the largest number ever present at this annual event. Among the many games and contests for which generous prizes were awarded there were several novelties, including a push-ball contest between electrical contractors and inspectors. A marked feature of the picnic was the co-operative spirit in which the associations of contractors, inspectors, engineers, jobbers, credit men and other electrical interests joined with the members in promoting the success of the affair.

City of Milwaukee Enters Into Indeterminate Street-Lighting Contract for City Parks.

The city of Milwaukee through its park board has entered into a contract, under the indeterminate form, with The Milwaukee Electric Railway & Light Company to light Lake and South Shore Parks. The parks have heretofore been partially lighted by gasoline lamps. The contract provides for a readjustment of prices per lamp per year in accordance with the cost of service annually and gives the municipality the right to terminate the contract at any time after two years upon payment of the unamortized investment in special street-lighting equipment. Plans are now being made for the lighting of other city parks under the same form of contract.

This contract comprises the fifth indeterminate street-lighting contract entered into by The Milwaukee Electric Railway & Light Company and its associated companies, the cities of Racine, Whitewater, Wauwatosa and the village of West Milwaukee having already entered into indeterminate street-lighting contracts.

The rate per lamp per year, according to which service is delivered during the first year, and the type and number of lamps supplied under these various contracts, are as follows:

Location	No. Lamps	Type	Source of Supply	Initial Rate per Lamp Yr.
Lake Park, Milwaukee	192	250-candlepower series Mazda	Underground	$35.94
South Shore Park, Milwaukee	28	600-candlepower series Mazda	Underground	35.94
Racine	345	4-ampere Magnetite	Overhead	53.52
	10	4-ampere Magnetite	Underground	78.70
	278	80-watt series Mazda	Underground	20.16
	12	80-watt series Mazda	Overhead	28.06
Whitewater	40	600-candlepower series Mazda	Overhead	48.74
	88	100-candlepower series Mazda	Overhead	22.04
Wauwatosa	220	60-candlepower series Mazda	Overhead	18.45
	8	250-candlepower series Mazda	Overhead	26.89
West Milwaukee	28	600-candlepower series	Overhead	42.34
	0	1000-candlepower series		54.15

Negotiations with respect to other contracts are pending in other cities in the Milwaukee district.

The indeterminate form of contract was first described in a paper by S. B. Way, read before the Milwaukee Electrical League, and which was abstracted in ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, February 21, 1914. The details of this type of contract were described in a paper read by G. W. Van Derzee before the Wisconsin Electrical Association and abstracted in ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, May 6, 1916.

Electrical Exports for May Break All Previous Monthly Records.

The official figures on the electrical exports of the United States for May (taken from the monthly summary of foreign commerce issued by the Bureau of Foreign and Domestic Commerce, Washington, D. C.), show a total far in excess of any previous month. The total value of electrical shipments last May was nearly 91 per cent over that of May, 1915, and nearly 17 per cent over that of February, 1916, which was the highest monthly figure previously recorded.

To what extent the electrical export trade is increasing in volume as well as value it is difficult to state, since the government reports give the numbers of articles shipped for only four electrical classes. For these classes the numbers compare as follows:

Articles	Numbers Exported in May, 1916	May, 1915
Electric fans	2,609	2,013
Arc lamps	158	46
Carbon-filament lamps	79,474	60,496
Metal-filament lamps	798,499	257,104

In the following table are given the detailed figures for last May and for the corresponding month a year ago:

Articles.	May, 1916.	May, 1915.
Batteries	$ 157,397	$ 79,618
Dynamos or generators	133,534	84,153
Fans	33,528	28,838
Insulated wire and cable	292,086	302,029
Interior wiring supplies, etc. (including fixtures	38,393	131,600
Lamps—		
Arc	2,539	1,200
Carbon-filament	9,833	7,593
Metal-filament	140,649	42,232
Meters and other measuring instruments	79,641	67,813
Motors	428,984	209,014
Telegraph instruments (including wireless apparatus)	16,187	2,968
Telephones	358,675	57,090
Transformers	173,988	23,217
All other	1,572,175	764,844
Total	$3,437,609	$1,802,209

For the first 11 months of the last three fiscal years, in each case ended on May 31, the electrical export totals are as follows:

Eleven Months of Fiscal Year.	Electrical Exports.
1913-1914	$23,610,407
1914-1915	17,724,676
1915-1916	27,103,876

Electric Power in Jobbing Foundries

Industrial Conditions Have Made Necessary Overtime Operation and Extensions in Most Foundries—Advantages of Central-Station Service Are Pointed Out and Data Given on a Typical Plant

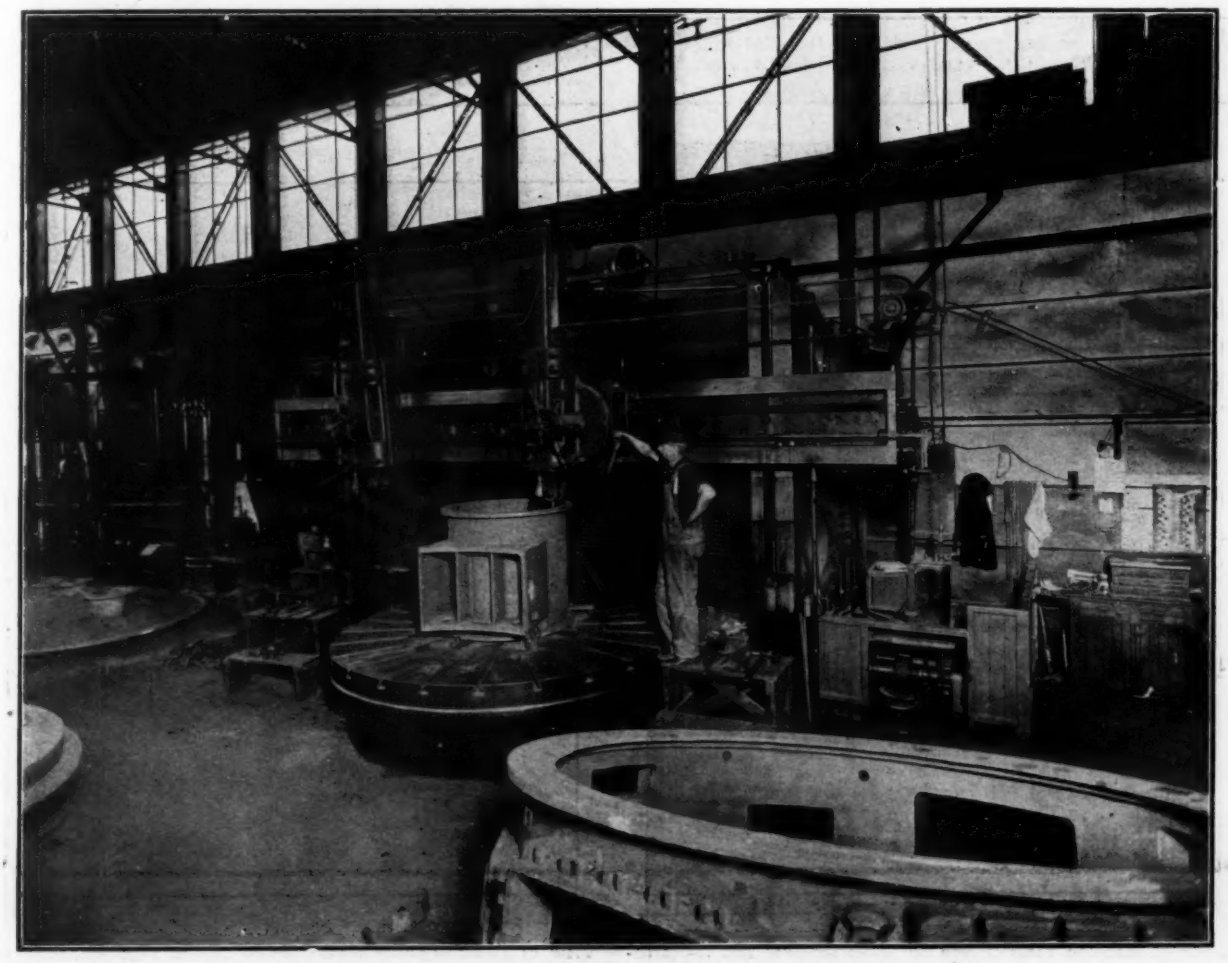
Industrial Power Series—Article No. 175

At the present time there are a large number of extensive shops throughout the country that are devoted exclusively to turning out finished and machined castings on order. The Straight Line Engine Company, Syracuse, N. Y., is an example of an establishment of this kind. This company was originated by the late Professor Sweet and for many years manufactured steam engines of small sizes, but now the plant is devoted to the production of gray-iron castings, loam or green sand, either unfinished or machined. Included in the departments are a well-equipped pattern shop, foundry and machine shop. Electric motor drive is used in all of these departments.

It is interesting to note how central-station service was introduced into this plant. There is a direct-current power plant in the works including three 150-horsepower boilers, a 150-horsepower steam engine direct-connected to a 220-volt, 75-kilowatt, direct-current generator, and an 80-horsepower engine belted through line shaft to a 50-kilowatt generator with the same characteristics. At the present time this plant furnishes current for five electric traveling cranes, a 15, 10 and 5-ton crane in the foundry, and a 15 and a 5-ton crane in the machine shop. Current is also supplied to a few direct-current motors. In the foundry there was installed a cupola blower driven by a 75-horsepower induction motor for which central-station service was contracted for. This constituted the peak load and was on from 4 to 6 p. m. The rates were so satisfactory that about 15 additional motors were installed, displacing several direct-current machines. These are all 25-cycle, 440-volt, squirrel-cage type, induction motors. Service is supplied for these machines by the Syracuse Lighting Company. It is the intention to install an induction motor to drive the 50-kilowatt direct-current generator, the principal reason being that service is always available nights and Sundays so that the boiler plant may be shut down. It may be stated that the Straight Line Company furnished steam to an adjoining plant, also that it has found that it can operate its direct-current, engine-type unit during the winter to advantage, using the exhaust steam for heating purposes.

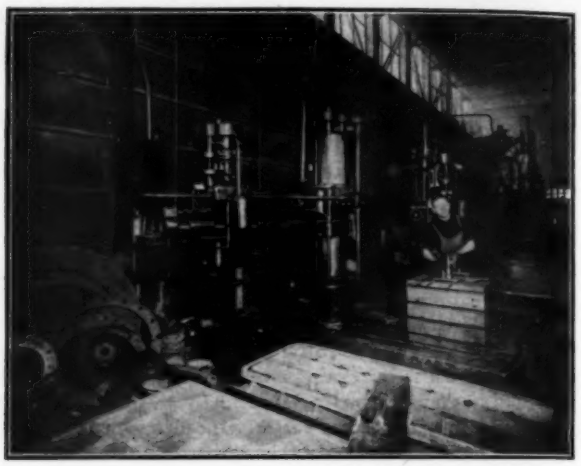
Advantages of Motor Drive.

Probably one of the greatest advantages of motor drive in a manufacturing plant of this kind is the ability to operate single machines or groups of machines independently night and day, Sundays and holidays. It frequently happens that some particular work is dragging behind and only a few machines need



Fourteen-Foot Boring Mill in Foundry Operated by Two Direct-Current Motors.

Motor Driving Group of Machines in Pattern Shop of a Foundry.



Two Motor-Driven Radial Drill Presses in Foundry.

be worked overtime to pick up this work. This can be easily accomplished as motor drive with central-station service is instantly available night or day. Another advantage is that machines may be located with reference to the logical sequence of the work without regard to the power which cannot be done where mechanical power is transmitted from a central source. Friction loads frequently amount to a large percentage of the total power requirements with mechanical transmission of power. Where electric motors and group drive are employed this loss is greatly reduced, as small shafting and light belts are sufficient. With individual drive the friction losses are entirely eliminated with the exception of the friction of the machine itself.

Control is simplified and a wide range of speeds are available by simply turning the controller handle. Increased production results from being able to secure the proper speed for the work in hand and the uniform speed of a motor for each increment also adds to the production as there is no belt slippage nor whipping of the shafts. Time in manipulating the cumbersome mechanical speed-changing devices is also saved. The upkeep and repair bill where mechanical drive is used forms a considerable item which is greatly reduced where electric drive is employed. Better natural light results from the elimination of a large part of the shafting and belting and shops may be maintained in a cleaner and more hygienic condition. A break down in any department does not affect the remaining departments with the consequent losses and delays that occur where a central mechanical power plant is depended upon for power. Additions to the machine equipment can be quickly and easily made, as it is only necessary to run a set of feeders to the motor without regard to existing equipment. In general, there is much less wear and tear of buildings owing to the elimination of heavy line shafting and this feature alone is of considerable importance. When adding new buildings to a

Group of Machine Tools Driven by 55-Horsepower and 15-Horsepower Motors.

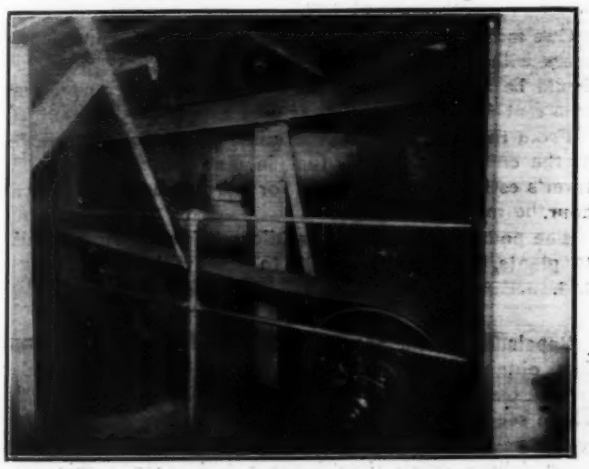
View of 75-Horsepower Motor Which Drives Ingersoll-Rand Air Compressor.

plant no consideration has to be given to available power as electric power can be utilized on any floor of any building regardless of the location.

Foundry Equipment.

As stated before, gray-iron castings are made and it may be explained that gray iron has three principal grades, Nos. 1, 2 and 3. The characteristics of these grades are: No. 1—Large, dark open-grain iron, softest of all numbers and used exclusively in the foundry. The tensile strength is low as well as the elastic limit, and the fracture is rough. It turns soft and tough. No. 2.—A mixed large and soft dark grain, harder than No. 1 iron and used exclusively in the foundry. The tensile strength and the elastic limit are higher than that of the first number, the fracture is less rough, it turns harder, is less tough and more brittle. No. 3.—Small, gray, close grain, is harder than No. 2 iron, and is used in either rolling mills or foundries. The tensile strength and the elastic limit are higher than the last number; it turns hard, is less tough and less brittle.

There is one cupola in the foundry and at the present time the average weight of iron melted daily is 30 tons. Air for the cupola is supplied by an American No. 10 foundry blower geared to a 75-horsepower induction motor. There are two tumblers and an exhaust fan for removal of the dust group driven by a 10-horsepower induction motor running at 1,720



Motor Driving American Blower Company Foundry Blower.

revolutions per minute. Sand for cores is sifted by a rotary sifter belted to a five-horsepower induction motor. There are two ventilating fans, one belted to a 1.5-horsepower induction motor, and another belted to a five-horsepower induction motor. The latter fan connects with a hood in front of the core ovens. To supply air to the jarring machines and air hoists in the foundry there is an Ingersol-Rand 12 by 14-inch air compressor belt driven by a 75-horsepower induction motor operating at 1,743 revolutions per minute. There are also several motor-driven jarring machines. These machines consist of an iron table which is vibrated in a vertical plane by a suitable mechanism. The flask with the pattern in it is placed on the table and the vibrations pack the sand so that hand ramming is eliminated.

Pattern Shop.

There is a fully equipped pattern shop in which the machines are group driven by a 15-horsepower induction motor operating at 1,723 revolutions per minute. The machine equipment includes two band saws, face-plate lathe, pony planer, surface planer, rip saw and two wood lathes. There is a third wood lathe which is driven from one of the machine shop line shafts.

Machine Shops.

In the machine shops there are four individually-driven machines. A 14-foot boring mill driven by a 220-volt, shunt-wound, direct-current motor through gears. This motor has a range of speeds from 450 to 1,350 revolutions per minute by field control. The cross rail is manipulated by a five-horsepower direct-current motor. There are two radial drills, a six-foot and an eight-foot, the former is geared to a 10-horsepower induction motor with a speed of 750 revolutions per minute and the latter is geared to a 15-horsepower, shunt-wound, direct-current motor with a range of speeds from 870 to 1,724 revolutions per minute. The fourth individually driven machine is a 30-inch planer which is belted to a 15-horsepower induction motor operating at 1,724 revolutions per minute. The various groups of motor-driven machine tools are listed herewith.

MOTOR DATA.

No.	Hp.	Speed R.p.m.	Kind of Drive	Application
1	75	1742	Belt	Ingersol-Rand air compressor. Furnishes air to jarring machines, air hoists, etc.
2	15 & 5	450-1350	Gears	14-foot boring mill.
1	10	750	Gears	6-foot radial drill.
1	15	870-1750	Gears	8-foot radial drill.
1	15	1724	Belt	30-inch planer.
1	75	1743	Gears	American No. 10 foundry blower.
1	10	1720	Group	Two tumblers, exhaust fan for removing dust from tumblers.
1	5	.....	Belt	Core sand sifter.
1	1.5	.....	Belt	Ventilating fan.
1	5	.....	Belt	Ventilating fan for core ovens.
1	15	1724	Group	Small drill, turret lathe, two small hand lathes, 30-inch engine lathe, two 15-inch engine lathes, four 12-inch engine lathes.
1	55	1724	Group	Small shaper, small engine lathe, shaper, milling machine, two drill presses, two 36-inch planers, two 48-inch planers.
1	75	1724	Group	Group small machine tools in tool room, hack saw, 15-inch engine lathe, 48-inch engine lathe, 72-inch engine lathe, 12-foot boring mill, 4-foot boring mill, 36-inch planer, radial drill, horizontal boring machine. 6-foot boring mill.
1	5	1723	Group	Sensitive drill, drill press, drilling machine, small punch.
1	20	1723	Group	Engine lathe, small boring mill, turret lathe, 3-foot boring mill, two drill presses, double-spindle drill, two small radial drills, two small engine lathes, medium engine lathe, wood lathe.
1	5	1723	Group	Sensitive drill, drilling machine, small punch.
1	15	1723	Group	Two band saws, face-plate lathe, pony planer, surface planer, rip saw, two wood lathes.

Boston Edison Company Offers "Summer Comfort."

This letter was sent to 5,000 old-house-wiring prospects by the superintendent of sales, Boston Edison Company, a return mailing card being inclosed.

We have recently sent you a number of pieces of literature descriptive of electricity, and its various uses and adaptations in home life, which we sincerely hope that you have found of interest.

There are women today who energetically sweep each room; women who stand over a wash tub and rub, rub, rub; women who fuss over a hot stove on ironing day, to the detriment of their health, their complexions and their dispositions.

There are other women who simply turn a switch and clean house by the vacuum method in a few moments—long before the sun gets high,—and when washday comes, turn this task over to the electric washing machine.

There are items in the electrical equipment of the modern home which should be in *your* home. The matter of Summer comfort during these hot months is more than a matter of dollars and cents in the value of work done and time saved.

We will be glad of an opportunity to familiarize you with any feature of our electric service without cost or obligation on your part. Will you not allow us to explain to you the full value of electricity in your home?

Diesel-Engine Operation and Upkeep Data

Records of Several Successful Installations in the Southwest Presented Before Oklahoma Association

By L. W. W. Morrow

Assistant Professor of Electrical Engineering, University of Oklahoma

THE question of purchasing a Diesel engine hinges on first cost and maintenance cost of the engine as there seems to be entire agreement in regard to the fuel economy. At the present time there is a discussion regarding the mechanical and operating features of the engine and exact data on existing installations have not been available in sufficient amount to determine the status of the engine. Data of this nature are difficult to obtain and analyze for several reasons: Diesel installations are of comparatively recent date, in other words their life has not been determined by actual use; the operating and maintenance costs are vitally dependent upon the man in charge of the engine and in many cases high repair and maintenance cost has been due to the incompetency or inexperience of the man in charge of operation; installations with the same operating conditions and using the same grade of fuel and lubricating oil are the exception rather than the rule; users of the engine where it is in successful operation hesitate to publish production costs for fear of a rate decrease agitation or other results detrimental to their profits. The result of these reasons is seen in the meager information available to the purchaser whereby he can judge as to the economy of the Diesel for his business. The manufacturers are the principal sources of information and, since they are interested parties, the information from these sources is sometimes questioned.

In spite of the difficulties incident to introducing a piece of machinery to replace an established line, the Diesel is making rapid progress and, in 1915, 16 engines of 5,550 total horsepower were installed in Texas, Oklahoma, Kansas and Arizona.

The smallest engine was 120 and the largest 500 horsepower. During the present year one company has contracts for six engines in this territory with 4,040 total horsepower; three of the engines being of 1,000 horsepower each.

Fuel.

Fuel oil used by Diesel engines is usually purchased by analysis to insure the elimination of sulphur and other residum which would be detrimental to the operation of the machine. Instead of specific gravity the Baume scale is used in classifying fuel oil. Measured at 60 degrees Fahrenheit the usual fuel oil varies from 24 to 39 degrees Baume in the plants reporting for 1915. The cost of the oil varies from 75 cents to $1.25 per barrel at the plant, depending on freight rates and grade of oil. The type of fuel oil recommended by the manufacturers is from 22 to 33 degrees Baume with a flash point from 100 to 300 degrees Fahrenheit. A typical analysis of fuel oil used in a Texas plant is as follows:

Heat value—19,311 British thermal units per pound.
Baume—31.7 at 60 degrees Fahrenheit.
Burning point—180 degrees Fahrenheit.
Flash point—158 degrees Fahrenheit.
Sulphur, per cent—0.30.
Water, per cent—0.80.

For good operation, it is essential to purchase fuel oil by analysis and to obtain a uniform product. Sulphur and residual contents should be low; the first to insure the cylinders and valves, the second to keep valves, atomizer, fuel pipes, etc., free from sediment which would choke the fuel supply to the engine. If the valves, atomizer, fuel pumps, etc., are adjusted for one type of fuel oil it is well to continue using that type or else change adjustments for a new type.

There is no complaint as regards the type of fuel oil on the market excepting from one or two plants which state that it is difficult to obtain a uniform product when purchasing from different sources. One plant had trouble with choking of fuel supply pipes by sediment found in the oil.

The average cost of fuel oil per kilowatt-hour of eleven plants reporting was 0.349 cent with a minimum of 0.1135 cent and a maximum of 0.518 cent. The price is dependent on station-factor and price of oil. The economy of the Diesel is very high at small loads as compared to steam equipment. The average gallons of fuel oil per hour per engine of five plants reporting was 4.1 with a minimum of 3.35 and a maximum of 4.83.

One manufacturer claims the cost of fuel oil per kilowatt-hours with oil at three cents per gallon with 24 hours' run should be about 0.239 cent for a 1,000-horsepower engine and 0.245 cent for a 280-horsepower engine.

From the data obtained there is no doubt of the economy of the engine as regards fuel, in many cases the manufacturer's estimate was too high for the fuel cost per kilowatt-hour.

The pounds of fuel oil per kilowatt-hour, as reported by 10 plants, varies from 0.302 to 1.29 with an average of 0.98.

Repairs and Parts.

Repair cost data are perhaps the most variable of any data obtained, varying from zero to large sums, and to large extent are independent of the life of the engine. There seems to be agreement on the fact that the price of repair parts is very great, as one operator says: "I have heart failure every time I see a bill for a repair part." The data show that very few repair parts are necessary in the majority of instances but on the other hand most of the plants reporting are comparatively new installations.

The parts of the engine requiring most frequent repair are the valves and valve springs, stud bolts, pump plungers, fuel needles, pistons and rings, stuffing boxes and shafts.

COST OF REPAIRS IN 12 INSTALLATIONS.

Horsepower	Installed	Repairs 1915
1-120	3 years	$ 250.00
1-225	3 years	26.85
1-225	2 years	26.85
1-225	3 years	3960.00
1-225	2 years	336.00
2-225	2 years	3000.00
1-160	1 year	27.15
4-225	8 years	4412.59
1-240	1 year	00.00
1-225	1 year	49.54
1-500	1 year	533.90
1-225	1 year	375.00

Broken stud bolts and valve springs are the most frequent causes of shut downs; the piston rods and plungers wear rapidly where they touch the packing so that the proper grade of packing, put in by a competent man, will decrease repairs. The piston gives trouble in installations where there is dust, as pitting occurs and rapid wear on the cylinder. Piston rings wear rapidly and it is economy to replace them frequently as cylinder wear may be largely due to the hot combustion gases leaking past the piston

into the portion of the cylinder where lubrication is difficult. Fuel needles chip off at end and require frequent replacement. Operators complain of slow delivery of repair parts.

One plant overhauled a ten-year old engine and put it in shape at a cost of 4.48 mills per kilowatt-hour. The accompanying table gives a representative list of repairs in 1915 for several plants.

A consideration of the data shows how the cost of repairs varies so that any general conclusion cannot be obtained. The repair costs and life of a Diesel depend on the operator and the local conditions of installation to a very great extent. Engines in cement plants, flour mills, etc., or in windy, dusty localities have higher maintenance than normal installations. The general opinion of operators is that with a given installation the repair will be dependent on the attention the engineer in charge pays to his packing, piston rings, lubrication, load and air to the compressor. The engine should be stopped at least once a week and carefully adjusted and inspected by a capable mechanic. The engine should not be overloaded for any length of time as it is damaging to the cylinders and valves.

Labor.

The success or failure of a Diesel installation depends on the engineer in charge. In some cases a steam plant has been changed to a Diesel plant and operated by the same engineer with success, in others the reverse is true. In most cases the repair bill for the first six months will be large due to unnecessary items caused by the inexperience of the engineer in charge. A steam engineer who is a good mechanic can learn to operate a Diesel in a short time if he is instructed by a competent Diesel engineer.

One manufacturer states the average steam engineer can operate a Diesel after a few lessons from the erecting man and this is the usual manner of obtaining Diesel engineers for small plants in the Southwest.

Another manufacturer states there is no such thing as an average steam engineer and that the Diesel requires a man who is essentially an expert mechanic.

The Diesel is a high-grade and costly machine and should not be used for experimental purposes by a green man. It would be economical for many plants to send their engineer to the factory for instructions in Diesel operation and adjustment instead of having him learn from their installation with a resultant depreciation of the engine. Every plant reporting dwells on the fact that a capable mechanic should be in charge of the engine and several state that it is very difficult to obtain a competent man in this section.

The labor costs on the installations reporting, vary from 1 to 16 mills per kilowatt-hour and are independent of size of plant. The average cost is about 1.22 mills per kilowatt-hour.

The operating force of the plants reporting are from one to three men per 8, 10 and 12-hour shifts at salaries ranging from $150 to $75 per month per man with $85 as the average engineer's salary.

The cooling water gives trouble in some plants as regards cost. One operator uses 4,000 gallons per hour as compared to the manufacturer's claim of 1,500 gallons.

Conclusions.

As a result of the data and comments of operators reporting the conclusion may be drawn that the Diesel is operating successfully in all the installations as regards fuel economy. The length of life and maintenance of the engine are indeterminate from the data for several reasons: not enough installations have been in operation for a sufficient time; great improvements have been made in design; maintenance depends upon the personal competence of the engineer in charge.

In all cases where data are available the sum of the fuel and repair costs is less than the same costs would be for a steam installation. This is particularly true for small plants from 150 to 500 kilowatts capacity and there is no doubt regarding the operating economy of the Diesel for such installations.

The following data show tabular unit costs available from the information obtained and the different installations and operating data from which the conclusions are drawn. The remarks at the end of each plant sheet are those made by the person making the return from the plant, usually the manager or superintendent of the plant:

Alva, Okla.

Alva Light & Power Company.
Make—Busch-Sulzer. 4-cycle Diesel.
Rating—225 horsepower.
Type—3-cylinder, Type A.
Installed—October, 1913.
Cost of fuel oil per barrel, 1915—$1.15.
Barrels used in 1915—1,950.
Generator—200 kilovolt-amperes.
Reserves—2 steam, 75 and 90 kilowatts.
Peak load—150 kilowatts.
Kilowatt-hours produced, 1915—Diesel, 480,000; Reserves, 20,350.
Operating force per shift—one man per 12-hour shift at $100 and $75 respectively for day and night shifts.
Fuel cost, 1915—$2,300.78.
Wages, 1915, $2,580.50.
Water—$196.99.
Lubrication, waste—$302.52.
Pounds of fuel oil per kilowatt-hour—1.26.
Total operating cost per kilowatt-hour—$0.0108.
Fuel cost per kilowatt-hour—$0.0046.
Labor cost per kilowatt-hour—$0.0056.
Lubrication waste, water per kilowatt-hour—$0.0006.
General remarks: Have no record of shut downs but had a few for grinding valve seats and making adjustments. Engine in good condition and very satisfactory. The prime requisite for successful operation is a good man as engineer.

Yoakum, Tex.

Yoakum Power, Light & Water Company.
Make—Busch-Sulzer. 4-cycle Diesel.
Rating—500 horsepower.

DETAILED SUMMARY OF COSTS.

Rating Horse-power	Installed	Cost—Fuel, per bbl.	Gal. Oil per Hour	Lbs. Oil per Kwh.	Fuel Cost per Kwh.	Labor Cost per Kwh.	Repair Cost per Kwh.	Lubrication Cost per Kwh.	Total Operating Cost per Kwh.	Kwh. Produced
1-160	1915	$1.125	4.83	.887	$0.00325	$0.0083	$0.000188	$0.000792	$0.01263	144,053
2-225	1914	1.26	.....	1.05	.00295	.00354	.00432	.....	.01081	695,923
4-225	1915	1.265	.....	1.13	.00493	.0032	.00305	.00056	.01174	1,449,100
1-500	1915	.....	.....	.....	.028	.0113	.....	.....	.....	22,470
3-500	1915	.998	.....	1.151	.00307	.00144	.....	.0027	.00721	1,156,000
1-170	1913									
1-240	1915	.68	.....	1.29	.0029	.007655	.000655	.0018	.013	288,040
2-225	1911									
.....	1913	1.15	6.7	.302	.001135	.....	.....	.....	.....	1,545,765
2-225	1911									
.....	1913	.75	8.25	.825	.00215	.00621	.000045	.....	.01086	600,000
1-120	1912	1.05	4.03	1.04	.0035	.0119	.00154	.....	.0166	162,307
1-500	1915	1.20	.....	.95	.00396	.0062	.00106	.....	.01122	504,716
1-225	1913	1.15	.....	1.26	.0046	.0056	.....	.0006	.0108	480,000

Type—4-cylinder, Type B.
Installed—June 1, 1915.
Cost of fuel oil per barrel, 1915—$1.20.
Barrels used in 1915—1,590.
Hours operated per day—24.
Shut downs during 1915—4.
Reasons for shut downs—Worn-out packing ring and broken valve spring.
Time of shut down—30 minutes.
Generator—376 kilovolt-amperes.
Peak load—220 kilowatts.
Reserves—Two steam, 150 and 200 kilowatts.
Operating force—Two men per shift of 12 hours with $150 salary per shift.
Kilowatt-hours produced, 1915—Diesel, 504,716; Reserves, 76,569.
Fuel cost, 1915, Diesel—$1,908.11. Reserves—$6,135.10.
Repair cost, 1915, Diesel—$533.90. Reserves—$829.26.
Diesel fuel cost per kilowatt-hour—$0.00396.
Steam fuel cost per kilowatt-hour—$0.0788.
Diesel repair cost per kilowatt-hour—$0.00106.
Steam repair cost per kilowatt-hour—$0.0108.
Labor cost per kilowatt-hour—$0.0062.
Fuel and repair, Diesel, per kilowatt-hour—$0.00502.
Fuel and repair, Steam, per kilowatt-hour—$0.0896.
General remarks: Engine is in good shape and very satisfactory. Difficulty is encountered in obtaining a competent engineer. Objection is made to the price of repair parts.

Lyndon, Kans.

Lyndon Electric Light Plant.

Make—Busch-Sulzer, 4-cycle Diesel.
Rating—120 horsepower.
Type—Three-cylinder, belted compressor. Type A.
Installed—November, 1912.
Fuel oil—25 to 30 Baume.
Cost fuel oil in 1915—$1.05 per barrel.
Fuel oil used in 1915—540 barrels.
Hours operated per day—15.
Shut downs during 1915—Two.
Reasons for shut downs—(1) Needle sticking in valve. (2) Broken exhaust valve spring.
Average time of shut down—15 minutes.
Reserves—None.
Generator—Belted generator of 75 kilowatts rating.
Peak load—88 kilowatts.
Total kilowatt-hours produced in 1915—162,307.
Total cost fuel oil in 1915—$578.64.
Hours operated in 1915—5,614.
Wages, 1915—$1,939.60.
Operating force—One man per shift of 10 hours.
Repairs in 1915—About $250.00.
Fuel cost per kilowatt-hour—$0.0035.
Labor cost per kilowatt-hour—$0.0119.
Total cost per kilowatt-hour (fuel, oil, waste, etc.)—$0.0166.
Pounds of fuel oil per kilowatt-hour—0.825.
Kilowatt-hours per day—444.6.
Gallons fuel oil per day—62.06.
General remarks about operation: Total salary for 1915 includes all line work, house wiring and repair work in water and electric plant. The engine is satisfactory in every way. At the present time the cylinders are badly worn so that they will have to be rebored or replaced. There is no trouble with the operation provided close and careful adjustments are made and maintained. The chief operating trouble encountered lies in wear of cylinders and valve and pump plungers where they rub on packing. The latter trouble was remedied by changing from asbestos packing to Ambest. The engineer states that at light loads there is not complete combustion so that carbon collects on upper part of rings and piston thus causing wear on the cylinder. An extra piston was purchased in 1915 so as to replace piston rings and seats without shutting down engine. The engine is giving excellent results and fills all requirements.

Wellsville, Kans.

Wellsville Electric Light & Power Company.

Make—Snow, 2-cycle Diesel.
Rating—120 horsepower.
Type—Single-cylinder, horizontal.
Installed—August, 1914.
Fuel oil—24 to 26 Baume.
Cost of fuel oil—80 cents per barrel at plant.
Fuel oil used in 1915—600 barrels.
Hours operated in 1915—6,000.
Reserves—None.
Generator—Belted generator of 80 kilovolt-ampere rating.
Peak load—100 kilowatts.
Operating force—One man per shift of 12 hours.
Fuel oil per horsepower-hour—0.035 gallon.
Fuel oil per hour—4.2 gallons.
Cost of fuel oil per hour—7.98 cents.
Shut downs during 1915—One serious shut down due to broken main shaft. Several short shut downs due to burning out connecting-rod boxes. Broken shaft was due to improper adjustment of main journals with outboard bearing. Boxes were burned due to improper oiling system and wrong kind of lubricating oil.
General remarks about the operation: The superintendent states that slightly better economy is being obtained in that territory with the 4-cycle type of engine. The heating of the boxes was eliminated by getting a new telescopic crosshead oiler and using a free flowing lubricating oil. Some trouble was encountered due to the fuel oil choking the atomizer, which arose from the fact that the oil in different shipments varied in content and quality and also because sediment settled in the bottom of the fuel-oil tanks. The engine was overhauled five months ago and since that time has been giving satisfactory operation.

Osage City, Kans.

Municipal Electric Plant.

Make—Busch-Sulzer, 4-cycle Diesel.
Rating—Two engines of 225 horsepower each.
Type—Type "A." Both three cylinder. One has belted compressor, the other direct-connected compressor.
Installed—1911 and 1913.
Fuel oil—39 Baume.
Fuel oil cost in 1915—75 cents per barrel of 42 gallons.
Fuel oil used in 1915—1,714 barrels.
Hours operated per day—24.
Shut downs during 1915—None.
Reserves—75-kilowatt steam-engine drive. Reserves not used in 1915.
Generator—Two 200-kilowatt direct-connected.
Peak load—250 kilowatts.
Operating force—One man per 8-hour shift.
Salary per shift—3 men at $70. One man at $100 including lineman.
Repair cost in 1915—$26.85.
Kilowatt-hours produced in 1915—600,000.
Total fuel oil in 1915—72,000 gallons costing $1,285.50.
Fuel oil cost per hour—0.148 cent.
Gallons fuel oil per hour—8.25.
Pounds fuel per kilowatt-hour—0.825.
Fuel cost per kilowatt-hour—$0.00215.
Labor cost per kilowatt-hour—$0.00621.
Total fuel and labor—$0.00836.
Kilowatt-hours per day—1,645.
Fuel oil per day—197.
General remarks on operation: The engines are satisfactory in every way. No operating trouble arises as each engine is overhauled and adjusted every two weeks.

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Minneapolis General Electric Company Makes New-Business Record.

The Minneapolis (Minn.) General Electric Company gained new business at a much faster rate during the first six months of 1916 than during the first half of last year. In 1916 the company made a net connected load gain of 9,608 kilowatts or 12,800 horsepower, this representing an increase in the ratio of gain of 42 per cent as compared with the advance in 1915, according to figures compiled by H. E. Young, sales manager. Lighting business was taken on in 33 per cent greater volume than a year ago, power business at the rate of 27 per cent more and there was a jump of 93 per cent in the gain in electric household appliances. The output of the company amounted to 74,067,680 kilowatt-hours, an increase of 31 per cent and the load-factor, a most significant figure in electrical operation, advanced from 52 to 54 per cent.

A new record was established also in the wiring of already-built houses, 1,627 new customers being added in this manner, an increase of 47 per cent over the similar business put on in 1915. Present year's sales of electric household appliances such as flat irons, washing machines, vacuum cleaners, etc., have amazed the dealers in these supplies, being nearly double that of last year. A considerable amount of power business recently closed by the company is not included in these totals and a number of large contracts are now being negotiated.

August Electric Range Campaign in Boston.

The Boston Edison Company is carrying on a campaign for the introduction of the Thermax electric range, which it is selling at its main and branch stores at $15,—$3 down and $2 per month. The regular price for this range is $20, but the reduced price is in effect for August only.

The primary object of the campaign is to induce householders to have a separate circuit put in for electrical

SPECIAL AUGUST SALE
A NEW ELECTRIC RANGE
Clean, Cool, Simple, Handy, Cheap to Use
A $20 Range at
$15
$3 down
$2 a month
No interest
See This Big Bargain in Actual Use at Any of the Following Edison Light Stores:
THE EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON

Advertisement Announcing Boston Range Campaign.

appliances, this being an entering wedge to the introduction of other domestic appliances taking the two-cent cooking, heating and refrigeration rate.

The Boston Edison Company has thus far sold over 800 electric stoves and ranges of all kinds.

Duplicate Contract Form Used by New Jersey Company.

The Public Service Electric Company, operating throughout northern and central New Jersey, has a uniform contract form for all lighting customers which presents in great detail the terms and conditions on which service is taken, rates per kilowatt-hour, etc. The sheet is in duplicate, each half being 8.5 by 14 inches, and divided by a perforation.

The front side of the form carries the contract date, terms and conditions, while on the reverse side are spaces, in separate columns, for data regarding customer's business and connections, his financial responsibility and distances between entrance and the nearest pole or circuit; another column provides for backing the paper with data as to location, individual or firm (with partner's name) or club or corporation contracting for the service; while another form is for ordering installations of light clusters, arc lamps or Nernst lamps.

The contract form folds in a quarter-size form 3.5 by 8.5 inches, convenient for filing.

Municipal Plant Raises Commercial Power Rates.

In contrast to the general reduction in rates for electricity which are being put in effect from time to time throughout the country, the city of Westfield, Mass., has advanced the light and power rates for electricity furnished by its municipal plant, effective August 1.

Heretofore the lighting rate was 7 cents per kilowatt-hour; it is now 9 cents. Former power rates were 4, 3 and 2 cents, varying with the amount of energy used. The new rates are: for the first 200 kilowatt-hours, 5.25 cents; next 300 kilowatt-hours, 4.25 cents; next 500 kilowatt-hours, 3.25 cents; next 1,000, 3 cents; next 3,000, 2.75 cents, and all in excess of 5,000 kilowatt-hours, 2.5 cents. The minimum charge for power is 75 cents per month plus 50 cents per horsepower of connected load.

It is hoped that the increase, which is due to increased costs of labor and materials, will be only temporary, and that as soon as conditions become normal the former rates will be resumed.

Commissions for Utility Salesmen Encourage Thrift.

The Consumers' Electric Light & Power Company, of New Orleans, La., has been experimenting in paying a commission to its salesmen on appliances, and has found it a very healthy stimulant. One salesman alone has collected commissions on the sale of at least 25 fans and a dozen irons within the past month and in addition to the money, it has brought him a tremendous amount of encouragement —an invaluable example to the other members of the department. Every man is finding stronger interest in his work, and an increase in production follows. The system has worked out so well with the salesmen that the company is contemplating extending this offer to all employees.

Advertising Practice of Central Stations

A Report on the Relative Merits of Various Classes of Advertising and Publicity Based on Interviews With Managers of Eleven Central-Station Companies

THE following information represents a boiled-down summary of eleven interviews with advertising and commercial managers of public service corporations along the lines of advertising practice in particular and commercial practice in general.

The advertising expenditures of these companies range from $30,000 to $225,000 annually and the information obtained is given with the idea that it may help other central-station advertising and commercial men form opinions on their various problems.

Newspaper Advertising.

Inquiry was made of all companies as to the mediums they were using in their advertising work. All companies favor newspaper advertising and the tendency in most cases is to use large space.

Four companies in the larger cities are using agency service, although copy in most instances is prepared by the advertising department of the central station. In the smaller towns copy is usually handled and written locally.

Of the eleven companies only one contracts for a fixed space daily. The others make space contracts and use the space as needed.

Where a number of newspapers are published in one city, all companies favor using only one paper a day, thus spreading out their copy over the week. Sometimes special occasions arise which necessitate using all papers on the same day, but otherwise this practice is adhered to.

With one exception, all of the eleven companies were opposed to advertising in Sunday papers. One advertising manager said that he preferred the Sunday papers in the winter when people were at home most of the day and also stated that he had obtained good results by watching the weather reports and running his advertisements on rainy Sundays.

General opinion is against advertising in special issues, although a certain amount of this kind of advertising is done for reasons of policy. This is a thing which the writer believes all advertising men should fight against, in order that all space bought might be bought strictly on the merits of the publication.

Four of the companies spend 30 to 50 per cent of their appropriation in the newspapers and the balance spend approximately 75 per cent of their appropriation in newspapers. In medium size places where daily papers are published this medium is used exclusixely but in the larger cities there is a greater field for direct-by-mail and other classes of advertising.

Advertising on Customers' Bills.

With one exception all of the companies are using their bills in some manner to carry a message to their customers. There has been a great deal of argument on this point, many persons saying that the physchology of this kind of advertising was wrong. The argument they put up is that "When you send a person a bill for anything, that is no time to approach him for another purchase". In spite of this theory, however, the decision by the advertising men is that this is one of the best mediums they have. The one company not using this medium sends their bills out on post cards and hence cannot employ this method.

Street-Car Advertising.

Only five of the companies are using street-car cards generally. Opinion as to the value of this class of advertising is divided. All companies owning or operating street-railway systems naturally use car cards, but the general conclusion reached is that this medium is not highly favored. Interest seems to be on the increase however.

Bill-Board Advertising.

Bill boards are in one sense in the same class as car cards inasmuch as they fall within the "Sign" class and appeal particularly to the memory. Bill boards are good mediums for trade-marked articles and are useful in popularizing anything. To get the benefit from money spent for this class of advertising the least amount of copy possible should be used. Three companies are using this medium generally for special sales and propositions. Two companies in large cities use it occasionally.

One company made an agreement with a local bill-board concern to contract for a certain number of running feet of bill-board space continually, provided these bill boards were illuminated. The agreement contained a clause whereby the company agreed to take other space (the total always remaining the same) on other bill boards as fast as the bill-board company could sell the illuminated space to other advertisers. This method has resulted in the illumination of a large volume of bill-board space and might be a good plan for other companies to follow. This plan could well be applied in the larger cities where the retiring habits of the population makes illuminated boards profitable.

Advertising in Picture Theaters.

Three companies in small towns use lantern slides in motion-picture theaters. One company is using motion-picture films of an educational and sales nature., Much interest was displayed in the latter medium and there seems to be indication that this medium will be utilized more in the future. Classes of a city's population and sections of a city might be easily reached without much waste circulation and on this account this medium is worthy of serious consideration on the part of all advertising men. In the smaller towns this is really the only form of amusement and the space secured (attention value considered) is relatively cheap per unit of circulation.

Direct-by-Mail Advertising.

This is such a large subject and can be discussed from so many different standpoints that no attempt will be made to go into great detail.

Eight of the eleven companies use this medium constantly. Classified lists of various prospects are obtained and these are circularized continually or on special campaigns.

The tendency is to use return post cards or coupons with every piece of matter sent out. The coupons or post cards that are returned serve as an introduction for salesmen as well as to give an indication of the effectiveness of the advertising. In this connection however, it should be remembered that in the majority of cases the purpose of the advertising is to assist in the selling of the product and not necessarily to produce inquiries. Circular letters and mailing cards and also other types of direct mail matter are not usually productive unless properly followed up. In some cases this medium may be used alone, but the cases are very few. One company went so far as to place stamps on 70,000 return post cards

on a special electric iron sale. 3,383 orders were received by mail as a result of this one piece of advertising.

Advertising Appropriations.

Not one of the eleven companies make a practice of setting aside an advertising appropriation based on gross revenue. The amount to be spent is usually estimated in advance from knowledge of the amount spent during the previous year. The actual amounts spent by the eleven companies average about 1 per cent of the gross revenue. In this amount is included expenditures for all publicity work. Estimates as to the amount a company was justified in spending varied from 0.4 per cent to 10 per cent of the gross sales.

House Organs.

Six of the eleven companies publish monthly house organs for employees, and three publish weekly house organs. One does not publish an employees' house organ at present but favors the idea. The other company publishes a combined house organ for employees and consumers and distributes this so that all employees receive the publication each month and each customer receives one copy a year. This is accomplished by distributing to different districts in the city each month in the year.

No companies permit paid advertising in employees' house organs.

Contributions are in some cases obtained through department heads, who suggest subjects, and have men in their department write articles on these subjects. Where corporations operate a number of properties, a corresponding or contributing editor, is usually appointed for each property or district.

Two companies publish a monthly house organ for their consumers. One publishes a quarterly house organ for consumers.

Opinions differ as to the customer house organ idea. This advertising and educational feature has not been developed on account of the large circulation necessary and the consequent large cost.

Unless the policy of the company is against it, paid advertising in consumer house organs is looked upon with favor and the majority of the publicity men questioned felt that advertising in such a publication should be solicited on a business basis and ought to produce good returns.

Four companies do all their educational advertising through their consumer house organs; four companies use newspapers for this class of copy and the remaining three companies seldom use copy of this nature.

Sales Policy.

Nine companies sell electric appliances and feel that this is a part of the central-station business which the company should not leave to local contractors. The opinion exists that the contractor ordinarily is a contractor and not a merchandising proposition and should be handled as such.

All of the companies selling appliances maintain list prices except on special campaign occasions. In the majority of cases all appliances are sold on the installment plan. The consensus of opinion is that terms rather than price is the governing factor in a sale although price concessions do make sales.

Practically all of the companies make minor repairs free of charge in order to keep the appliances in service all the time.

Real co-operation from contractors (where the company handles appliances) is not easy to obtain. One company gives the contractor a commission for all appliances which he sells during special campaigns if the contractor will put in a window display.

One company has formed a "Wire-Your-Home" League composed of a number of prominent contractors. This company does no regular wiring business. The city is being worked intensively to wire already-built houses and good co-operation is being secured. The campaign is planned to run indefinitely. Special prices have been made for this campaign and the idea seems to be working out well.

There ought to be some method by which contractors and the central station could work in harmony in this matter but the real solution has not yet been found. In the meantime each one is going his own way and consequently results obtained are not in proportion to the work done.

Electric Sign Campaign at Stockton.

A campaign to increase the number of electric signs on its circuits is being carried on by the Western States Gas & Electric Company, of Stockton, Cal., with excellent results. A sign expert was employed by the company to make a personal canvass of all prospects.

As an inducement to the merchant, the company purchases the electric sign, erects it, furnishes the energy necessary to operate it and maintains the sign on a flat-rate basis with the stipulation that the merchant pays for the sign in 24 equal monthly installments. At the end of two years, therefore, the sign becomes the property of the merchant and his monthly payment is reduced simply to the cost of energy and the maintenance of the sign.

In referring to the campaign, General Manager Kahn, of the Western States Gas & Electric Company, states, "We are endeavoring to educate the merchants to charge his sign expense to advertising and not to cost of fixtures. When reducing this expense to a per-day basis, it is surprisingly small and inasmuch as the sign, which we are pushing is a day sign as well as a night sign, the offer is very tempting to the merchant as an advertising feature."

MERCHANTS
—OF—
STOCKTON
NOTICE
Do You Want an Electric Sign?
IF YOU DO
THE WESTERN STATES GAS & ELECTRIC CO.
OFFERS YOU
10-ELECTRIC SIGNS-10
Installed completely on your premises and designed especially for your business.
Absolutely No First Cost to You
Under our plan there is absolutely no reason for any merchant to be without the finest of business aids—
AN ELECTRIC SIGN
WARNING
Of necessity we are obliged to limit this offer, and if you wish to know all about our plan, kindly place your application immediately and our representative will call. Remember this places you under no obligation to accept our offer.
PHONE 711—ASK FOR SIGN DEPARTMENT
Western States Gas & Electric Co.
48 North Sutter Street, Stockton

Newspaper Advertisement of Electric Sign Campaign.

The accompanying illustration shows one of the newspaper advertisements used by the company during the campaign. In addition, an elaborate window display is being maintained showing one of the signs in operation.

ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

THE BURNING OF ARMATURE COILS.

By R. L. Hervey.

Motor and generator armature coils are burnt out, due to a short-circuit in the coil itself, or by a short-circuit in the commutator. The heat that destroys the insulation on these coils is produced by a current generated in the same manner as the current in a generator armature, but as the coil is closed on itself, thereby having a low resistance, the current rises to a

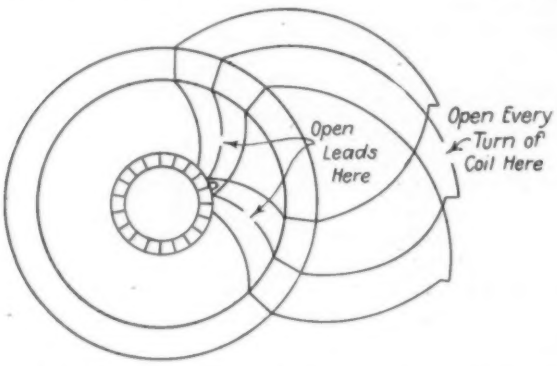


Fig. 1.—Method for Cutting Out Burned Coil in Lap Winding.

very high amperage, and it is this local current that heats the armature in a portion of its coils, destroying their insulation. If the machine is operated with one or more burnt-out coils, the heat generated in them will destroy insulation on the adjacent coils, and this burning will continue until the entire armature insulation is ruined.

In some types of armature windings, one burnt coil requires the winding of the entire armature, but in other types the damaged coils may be removed and new ones put in their places. Again, one or more coils may be cut out and the armature continue to give apparently the same satisfaction as before. When a coil is to be cut out of an armature with a lap or wave winding, there are two requirements that must be fulfilled, namely: the two commutator bars to which the coil is connected must be connected together by a jumper of the same carrying capacity as the coil; and, each convolution or turn of the coil must be cut in such a manner that no two ends can get together.

In a lap winding in which the coil is connected to adjacent commutator bars, the leads are removed from the bar and cut off; the two bars being connected together as shown in Fig. 1. To cut a coil out of an armature having a wave winding much more care and skill is required. Fig. 2 shows the connection of a 19-coil, 4-pole wave winding. This small number of coils would not, of course, give good commutation, but to put in more coils would only make the drawing less clear. From the diagram it is evident that when a short-circuit occurs between two commutator segments as *a b* that there is a short-circuit through the two coils *A* and *B* and both coils will be burnt out. This condition requires each coil to be opened as mentioned above by taking out a half inch or more of each turn, and securing the free ends so that they cannot move. The coil ends can be best secured if the piece be cut out of the coil between the core bands, although it is often convenient to open the coil in the end connection. Fig. 2 shows the two jumpers connecting the segments to which the burnt coils *A* and *B* had been connected.

Armatures with slotted cores usually have two or more coils per slot; when one coil becomes overheated, the coils sharing the same slot are sure to be destroyed unless the trouble is promptly removed. In case the two coils per slot are burnt and are to be cut out, it is not necessary to replace each of the four coils with a jumper. If the four coils, as shown, are to be cut out, the two bars, *a b* and *j k*, should be connected by a short jumper, then these two groups connected together. This takes care of coils *A* and *C*. Applying the same method to coils *B* and *D* bars *a, s,* will be connected by a short jumper and *k, s,* by a long one.

The question: "What effect does the cutting out of coils have on the operation of the motor?" is often asked. The writer has never had the opportunity to measure the exact effect, if any, on the change in speed of a motor or the voltage of a generator, as the conditions before the repair are seldom exactly known. Frequently there is a slight sparking at the segment to which the jumpers are connected as the coil connected to this segment is not in its proper position in the magnetic field when it is commutated. There is also a slight unbalancing and variation of the load on the winding as the dead coils pass from one section of the field to the other.

When an armature is being wound there is danger of the coils being damaged by the hammering that is necessary to place them properly; but after the winding is complete, and, if it has been properly done, there should be no trouble encountered in any individual coil.

The commutator is the principal source of armature trouble. The presence of oil on the commutator surface or ends causes

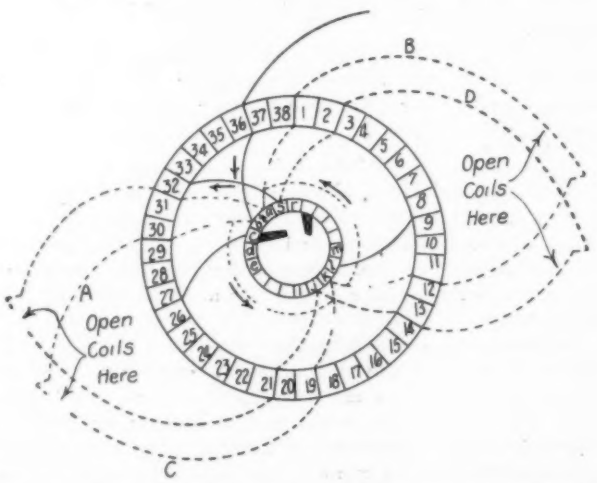


Fig. 2.—Method for Cutting Out Burned Coil in Wave Winding.

the binder in the mica board to disintegrate, thus producing small openings in which the carbon and copper become imbedded. As soon as a thin layer of this dust connects two commutator bars, a small current leaks through it. This current, once started, proceeds to burn a larger path for itself until there is sufficient current flowing to destroy the coil insulation. To prevent this occurrence, the commutator and brushes should be kept clean and free from oil.

Polyphase Motor Windings--III.

By Justin Lebovici

In this article polyphase windings of different types are being taken up. The consideration of closed two-layer windings in the first two installments is completed this week, and in the next installment open windings will be dealt with. Numerical examples are worked out and illustrated for the various cases, and special attention is given to the mechanical design of the windings. In future installments single-layer windings and windings for two speeds will be described.

Closed Mesh-Connected Polyphase Windings.

It has been shown that all closed windings can be represesented by equivalent ring windings. Referring to Fig. 24, it is seen that by applying two slip rings, A and B, to the ring winding R, we are able to obtain single-phase alternating current. The potential diagram is shown in the right of the figure and the winding-factor for the case of the distributed winding is

$$f_w = 2/\pi$$

as has been explained previously.

The ring winding in Fig. 24 has been replaced by a circle, R, in Fig. 25 for simplicity and three-phase current is obtained

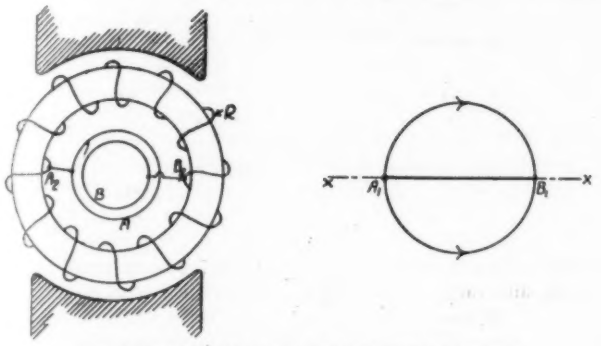


Fig. 24.—Ring Winding and Potential Diagram.

from three slip rings connected to the winding by three taps A_2, B_2 and C_2 equally spaced around the armature. Alongside is the potential diagram for this three-phase winding. The effective voltage between slip rings A and B is represented by line $A_1 B_1$. The algebraic sum of the voltages generated in the conductors distributed on the ring between A_2 and B_2, in Fig. 25, is represented by the arc $A_1 B_1$. The winding-factor is then

$$f_w = \text{chord } A_1B_1/\text{arc } A_1B_1 = \sin 120° \div \pi/3 = 0.83$$

Similarly, Fig. 26 represents a ring winding with four slip rings A, B, C, and D, for the collection or introduction of two-

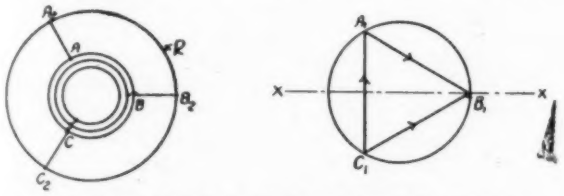


Fig. 25.—Three-Phase Winding and Potential Diagram.

phase (or quarter-phase) current. Adjacent is the potential diagram, and the effective voltage between slip-rings A and C is represented by the line $A_1 C_1$; the voltage between rings B and D is represented by the line $B_1 D_1$; and the voltage between rings A and B is represented by the line $A_1 B_1$. The winding-factor is then

$$f_w = \sin 45° \div \pi/4 = 4 \times 0.707/\pi = 0.90$$

Figs. 24, 25 and 26 give the potential diagrams of closed simplex bipolar windings, either lap or wave. The potential diagram of a closed, multipolar, lap, simplex winding having p pairs of poles will be represented by p such circles or inscribed polygons. If the winding is a multiplex winding, with a field displacement m, the potential diagram for one pair of poles will be given by m polygons slightly displaced from each other. The potential diagram of a closed, multipolar, wave, simplex or two-circuit winding is given by Figs. 24, 25 and 26, since this winding can be replaced by a bipolar ring winding regardless of the number of poles. If this winding is a multiplex winding instead of simplex, the equivalent ring winding has $2a$ poles and the potential diagram will be represented by a circles or polygons.

The instantaneous value of the electromotive force between slip rings A and B is equal to the projection of the line $A_1 B_1$ on the horizontal xx provided the points A_1 B_1 have the same position in the diagram as the points A_2 B_2 have in space at the instant under consideration.

The Function of Slip Rings and Commutators.

Before closing this chapter on the closed windings it will be well to consider the fundamental differences between the functions of slip rings and commutators.

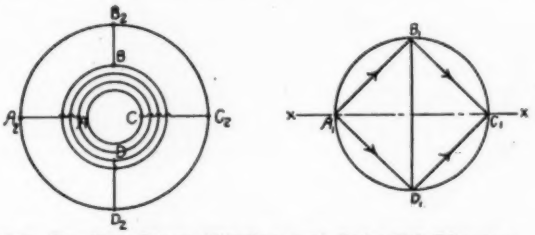


Fig. 26.—Two-Phase Winding and Potential Diagram.

Assume that the two diametrically opposite points A_2 and B_2 of the ring winding shown in Fig. 27 are connected to two slip rings A and B, and that the two brushes B_R are employed to collect current from the winding which is driven in the field ϕ of constant intensity. The voltage between slip rings at any

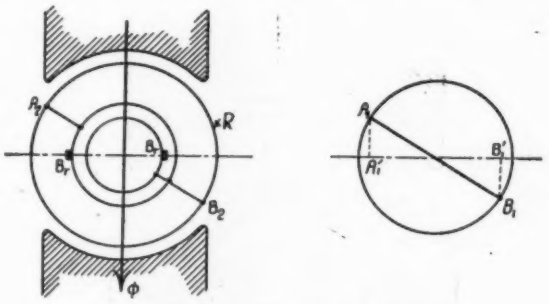


Fig. 27.—Armature With Slip Rings.

instant is equal to the projection $A'_1 B'_1$ of the line $A_1 B_1$ if we imagine the line $A_1 B_1$ rotating in synchronism with the winding R. $A_1 B_1$ also represents the amplitude of the voltage between rings. For each revolution of the armature there is a variation in the voltage from a maximum in one direction through zero to a maximum in the opposite direction and again through zero to a maximum in the first direction. In other words, a current of the frequency of armature rotation will be collected from the slip rings.

If we substitute a commutator C, Fig. 28, for the slip rings A and B in Fig. 27 and apply the brushes B_R as before, the line $A_1 B_1$ representing the voltage between brushes, remains unchanged so long as the field ϕ is constant. This is due to the fact that the number and position of the coils between brushes

is always the same, since as one coil leaves one circuit it is replaced by another from the other circuit. With a commutator, therefore, we obtain a current of the frequency of the field ϕ.

The function of the commutator is, in general, as follows. It adds up the electromotive forces generated in the individual coils and changes their frequency to the frequency of the field. With a direct-current field, direct current is obtained from the brushes. With a field alternating in character, alternating current of the frequency of the field is obtained from the brushes.

If the winding is connected to both a commutator and slip ring, as shown in Fig. 29, we have the following different conditions of operation which are possible.

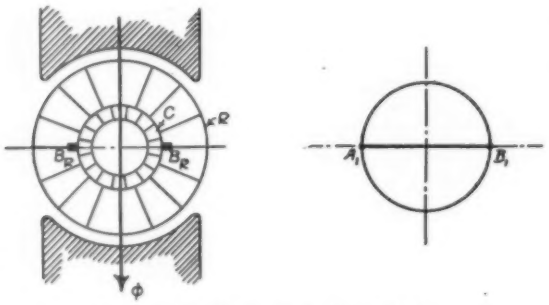


Fig. 28.—Armature with Commutator.

(1) If the armature is driven, by some prime mover for example, we can collect direct current from the commutator and polyphase alternating current from the slip rings, of a frequency corresponding to the speed of rotation.

(2) If direct current is supplied to the armature and field, the machine can be used as a direct-current motor or as an "inverted" rotary converter.

(3) If alternating current is supplied to the armature and direct current to the field, the machine can be used as a synchronous motor or as a rotary converter.

(4) If the armature is placed in a single-phase field and the brushes on the commutator are short-circuited and shifted from the neutral position, we have a single-phase alternating-current motor which can be started as a repulsion motor with the slip rings open-circuited and then operated as an induction motor with the slip rings short-circuited. (Schüler motor.)

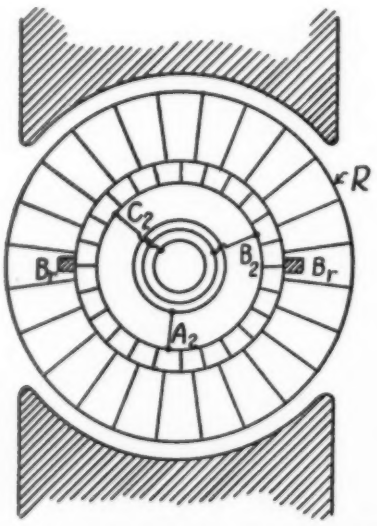


Fig. 29.—Armature with Both Slip Rings and Commutator.

(5) If such an armature is placed in a direct-current field and the slip rings connected to reactances forming a neutral, we have a three-wire direct-current generator.

The following example will show how the tap points A_2, B_2, and C_2 in Figs. 24 to 29, can be located in a common drum winding.

Example No. 9.

Assume a six-pole lap-wound armature having 27 slots and two coils per slot. The winding is to be connected to slip rings and a commutator such as to make it possible to use the machine as a three-phase rotary converter. We have

$Z=27 \quad S=54 \quad K=27 \quad p=3 \quad a=3 \quad y_a=2$

The equivalent ring winding shown in Fig. 25 will consist of three ring windings each having $K/p=27/3=9$ commutator segments and the points A_2, B_2, and C_2 will be $K/pn=9/3=3$ commutator bars apart. The points under the other poles corrpesonding to A_2, B_2, and C_2 can most readily be found by locating the points which are equipotential to A_2, B_2, and C_2.

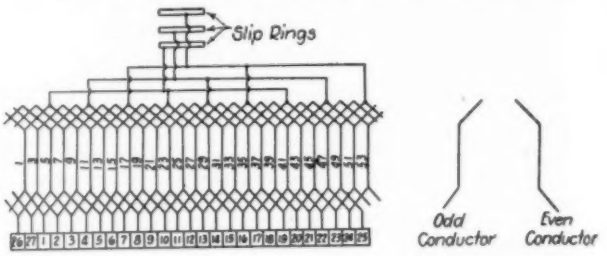


Fig. 30.—Winding Diagram for Example No. 9.

The pole pitch $\tau=54/6=9$ coil sides or conductors. We choose $y_1=4y_a+1=9$ and for a progressive winding.

$y_1-y_2=+2$

or $y_2=7$

$y_a=+1$

$y_p=S/p=54/3=18$

The winding may then be laid out as in Table IX and Fig. 30.

TABLE IX.

Commutator Bar.	Coil Side.	Coil Side.
1	1	10
2	3	12
3	5	14
4	7	16
5	9	18
6	11	20
7	13	22
8	15	24
9	17	26
10	19	28
11	21	30
12	23	32
13	25	34
14	27	36
15	29	38
16	31	40
17	33	42
18	35	44
19	37	46
20	39	48
21	41	50
22	43	52
23	45	54
24	47	2
25	49	4
26	51	6
27	53	8

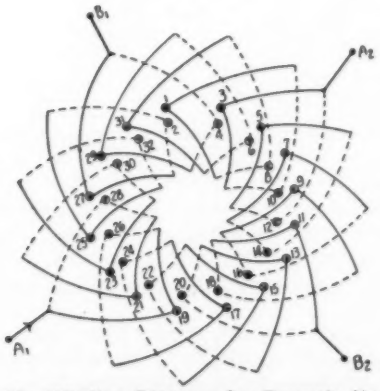


Fig. 31.—Winding Diagram for Example No. 10.

The equipotential connections will be:

1-19-37- 1

7-25-43- 7

13-31-49-13

Example No. 10.

Assume a two-pole, lap-wound stator, having 16 slots and two coils in each slot, to be wound for two-phase, with a short pitch. Since there is no commutator we will designate by K the number of coil noses. We have:

$p=1 \quad Z=16 \quad K=16 \quad S=32 \quad \tau=32/2=16 \quad y_n=2 \quad a=1$

We select $y_1=4y_n+1=9$

$y_2=7$

Since it is a two-pole machine the equivalent ring winding, Fig. 26, will consist of one ring, and the points A_1, B_1, C_1 and D_1 will be $K/4=16/4=4$ noses apart. Table X and Fig. 31 represent this winding.

TABLE X.

Coil Side.	Coil Side.
1	10
3	12
5	14
7	16
9	18
11	20
13	22
15	24
17	26
19	28
21	30
23	32
25	2
27	4
29	6
31	8

The effect of the short pitch can be clearly seen in Fig. 31, in which the dots and crosses indicate the direction of the current for the instant when the current in phase A is a maximum and is zero in phase B.

Example No. 11.

Assume a four-pole, two-circuit, wave-wound armature having 21 slots and two coil sides per slot to be connected to a

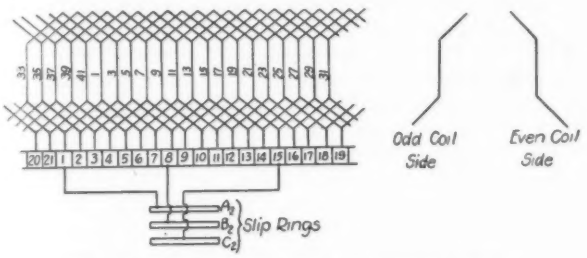


Fig. 32.—Winding Diagram for Example No. 11.

commutator having 21 bars and to three slip rings for the collection or introduction of a three-phase current. The winding is to be retrogressive. We have

$Z=21 \quad K=21 \quad S=42 \quad a=2 \quad p=2 \quad y_n=2$

$y=y_1+y_2=(s-a)/p=(42-2)/2=20$

$y_1=5y_n+1=11$

$y_2=9$

$y_k=(K-1)/p=(21-1)/2=10$

The front and rear connectors will be alike, since we have selected $y_1=11$ and $y_2=9$.

We have a two-circuit simplex wave winding; hence the equivalent ring winding will be represented by one ring as in Fig. 25 and the three points A_2, B_2, and C_2 will be $K/3=21/3=7$ coil sides apart.

Table XI and Fig. 32 represent this winding.

TABLE XI.

Commutator Bar.	Coil Side.	Coil Side.
A_2 —— 1	1	12
21	41	10
20	39	8
19	37	6
18	35	4
17	33	2
16	31	42
C_2 ——15	29	40
14	27	38
13	25	36
12	23	34
11	21	32
10	19	30
9	17	28
B_2 —— 8	15	26
7	13	24
6	11	22
5	9	20
4	7	18
3	5	16
2	3	14

Example No. 12.

Assume an 18-slot stator core to be wound with an eight-pole, four-circuit, wave, three-phase, closed winding, with two coils in each slot. We have

$p=4 \quad a=2 \quad Z=18 \quad S=36 \quad K=18 \quad y_n=2 \quad n=3.$

Since $K/a=18/2=9$ and $Z/a=18/2=9$ are whole numbers, the winding will be symmetrical.

According to (9) $y_k=(K\pm a)/p=(18+2)/4=5$

According to (8) $y=y_1+y_2=(S\pm a)/p=(36+4)/4=10$

$y_1=2y_n+1=5$

$y_2=5$

Since $y_k(=5)$ and $K(=18)$ have no common divisor, we will

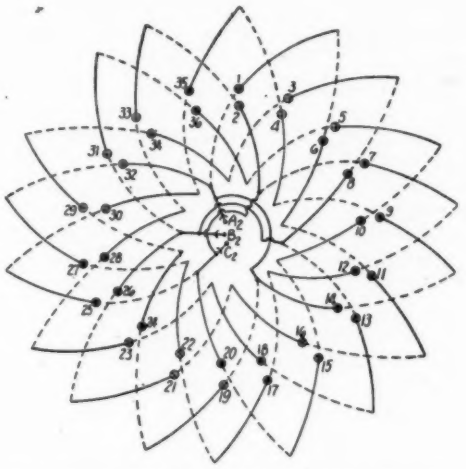


Fig. 33.—Winding Diagram for Example No. 12.

have a duplex, singly re-entrant winding. The equivalent ring winding will consist of two rings, each having $K/a=18/2=9$ noses. The taps A_2, B_2, and C_2 (Fig. 25) for the three-phase leads will be $9/3=3$ noses or six coil sides apart in the one ring winding, and the corresponding taps in the second ring are points equipotential to A_2, B_2, and C_2 and will be spaced $y_p=S/a=36/2=18$ coil sides from A_2, B_2, and C_2.

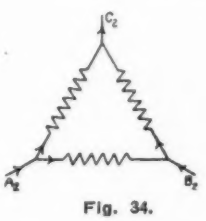


Fig. 34.

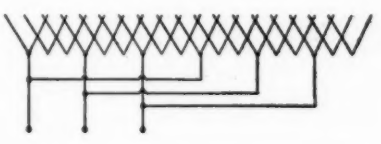


Fig. 35.

Table XII and Fig. 33 completely describe this winding. It will be noted, in Table XII, that the difference between two horizontal lines is always $2a$ or 4, and between two vertical lines is alternately equal to y_1 and y_2. Fig. 34 is a diagram similar to Fig. 25 and shows the usual representation of a three-phase mesh or delta-connected winding.

TABLE XII.

Conductor.	Conductor.	Conductor.	Conductor.	Conductor.	Conductor.	Conductor.	Conductor.
A_2 — 1	6	11	16	21	26	B_2 —31	36
5	10	15	20	C_2 —25	30	35	4
9	14	A_2 —19	24	29	39	3	8
B_2 —13	18	23	28	33	2	C_2 — 7	12
17	22	27	32				

As has been stated repeatedly before, it will be sufficient to state for shop specification, that *the coil lies in slots one and three and connects noses one and six.* For bringing out the leads a diagram such as is shown in Fig. 35 is all that is required.

I have to thank Mr. E. B. Stavely for his kindness in preparing the drawings and correcting the manuscript.

(To be continued.)

SLIPPING A POLE IN A ROTARY CONVERTER BY MEANS OF A FIELD REVERSING SWITCH.

By J. L. Yardley.

A frequently asked question is, What actually takes place in the machine when the polarity is made correct by means of a field reversing switch, in the case of an alternating-current self-starting rotary converter coming into synchronism with the wrong polarity? The following has been prepared in order to give a physical conception of the operation. The two methods of starting, first, with field broken up in sections and open-circuited, and second, with the field circuit closed and connected across the terminals of the machine, are also briefly described, as they are not generally understood.

Referring to Fig. 1, assume the field circuit open and the rotary converter in synchronism, rotating in clockwise direction as shown by the arrow, with the point D on the revolving armature coming under the center of the pole A at the instant that the flux due to the hysteresis or eddy currents is at its maximum in the direction $A\,B$ through the magnetic circuit; whereas, in order to have the correct polarity, the flux should be in the direction of $B\,A$. The field switch is then closed in the reverse direction, position 2 of Fig. 1; thus connecting the shunt field reversed directly across the armature without the field rheostat in circuit. The field rheostat being out of circuit, a larger current flows than would flow if it were left in the circuit with this connection, and a greater correcting effect is accordingly obtained. A magnetomotive force in the direction of $B\,A$ is established, which weakens or destroys the flux $A\,B$ which has held the armature in synchronism. Friction and windage losses then drag the armature back in counter-clockwise direction; *i. e.*, reduce, instantaneously, its rotational velocity in clockwise direction. The armature magnetomotive force continues to exist in the direction $D\,E$ as those points move, and, if the magnetomotive force $B\,A$ of the stationary field winding continued to exist, the armature would at once slip a pole and the point D would thenceforth always come under the center of the pole B at the instant of maximum flux in the direction $B\,A$. The rotary converter would then have the correct polarity, but the field rheostat would not be in circuit. However, as soon as the instantaneous position of D leaves the center A, the voltage which produced the magnetomotive force and flux $B\,A$ dies down. And, as the instantaneous position of D passes the mid-polar position C, that voltage reverses and tends to make a magnetomotive force and flux in the direction $A\,B$. Hence, after the instantaneous position of D passes C, the friction and windage drag upon the armature is balanced by a force of repulsion and the instantaneous position of D is thenceforth between B and C, at F near C. If, now, the shunt field is again reversed, by

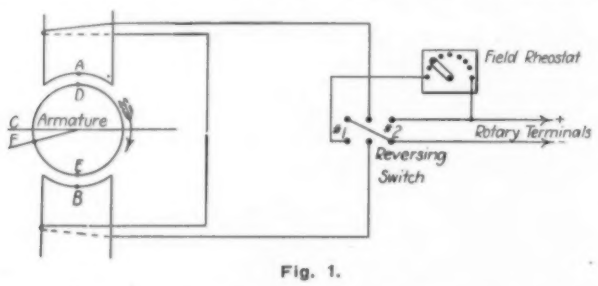


Fig. 1.

throwing the field switch over to the normal position, position 1 of Fig. 1, with field rheostat in circuit, a magnetomotive force is again set up in the direction of $B\,A$. This agrees in direction with the armature magnetomotive force $D\,E$. Hence, the instantaneous position of D is attracted from F to B and it thenceforth reaches that point synchronously with the maximum of the flux in the direction $B\,A$. Accordingly, the rotary converter now has the proper polarity, with the field circuit closed and the field rheostat in circuit, and the machine is ready for service.

The method of starting with field broken up in sections and open-circuited is shown in Fig. 2. The object in having the field circuit open at starting is to reduce the alternating-current input to a minimum. The object of splitting the field up in sections at this time is to prevent an insulation breakdown due to the high voltage generated by transformer action in the field winding after the alternating current is switched on to the armature. As the rotary converter comes up to

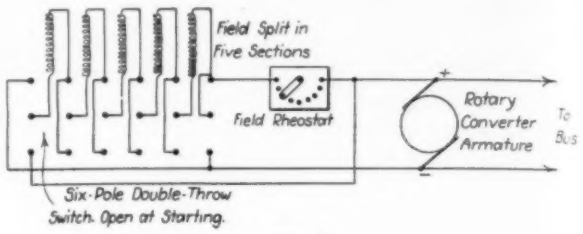


Fig. 2.

synchronism the operator watches the voltmeter swings, and endeavors to close the field switch at such an instant as will cause the machine to come up with the correct polarity the first time. If it comes up wrong, however, the switch is operated exactly as above described, in order to correct the polarity.

The method of starting with the field circuit closed and connected across the terminals of the machine is shown in Fig. 1. In this method of starting there can be no high voltage induced by transformer action in the field winding, for the very reason that the circuit is closed. The voltage induced is used up in forcing a small amount of current through the winding, with the result that the rotary converter takes a slightly greater alternating-current input than when started with field circuit open. Before the alternating-current circuit to the machine is closed, the field switch is closed in position 1, Fig. 1. When the machine comes to synchronism with the wrong polarity, this switch is opened and thereafter it is operated exactly as described above. If the machine comes to synchronism with the correct polarity, no operation of the field switch whatever is, of course, required.

It occasionally happens that, owing to the strength of the field induced by the alternating magnetizing current, the converter fails to slip a pole, and again builds up with the wrong polarity. This occurrence is independent of which method of field connections is employed and is due to the applied starting voltage being higher than necessary. This is overcome by opening the rotary-converter alternating-current starting switch momentarily, thus killing momentarily the alternating-current field. After the rotary converter has slowed down somewhat, the alternating-current starting switch is again closed. One or two trials will bring the desired results if the starting voltage is not unreasonably high. When the converter has pulled into step with the proper polarity, the starting switch is thrown over to the full-running-voltage position, and the field rheostat is adjusted for normal operation.

Locating Short-Circuits on Lighting Circuits.

In locating a short-circuit on a lighting circuit where current is available and where fuse plugs are used, I put a lamp in series with the line by removing one of the plugs and screwing the lamp in its place. The lamp will burn brightly until the line is clear. By turning the lamps off one by one at the sockets, by working the switches or disconnecting parts of the line until the light goes out the trouble can be located. If the supply current is from a grounded system and the light fails to burn with the line short-circuited, it is caused by an additional ground, in which case I change the lamp to the opposite side for obvious reasons.

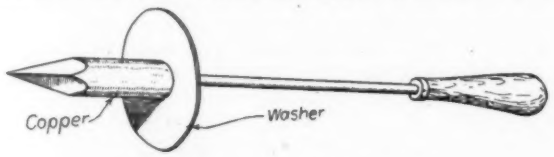
E. A. Davidson.

DOLLAR WIRING KINKS

Every reader is invited to contribute to this page It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Protecting a Soldering Copper.

When soldering joints or any thing else that requires a soldering copper, I find it very convenient to slip a fair-sized washer on the iron handle before I put the wooden handle on. When the copper is hot, the washer



Washer to Protect Soldering Copper.

is easily slipped up to the head. It will then prevent the hot copper from coming in contact with wood or other combustible material. It can thus be laid down quickly and safely in any place.

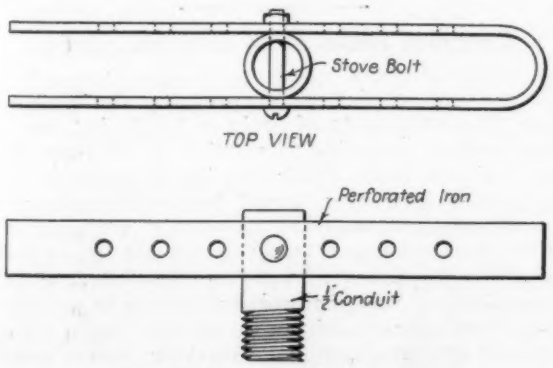
Benj. Swanson.

Taping Joints with Rubber and Friction Tape.

In wrapping joints with rubber tape and subsequently with friction tape there is always a tendency of the rubber compound to loosen, if not entirely to unwrap, before the friction tape can be applied to hold it in place. This difficulty is often the cause of a loss of time and in some cases results in an inefficient insulation of the joint. A little kink which saves time and makes it possible to hold the rubber tape securely in place is to lap the friction tape onto the end of the rubber compound before starting to wrap the joint. The lap need only be about one-quarter inch. The rubber tape is put over the joint as usual, but with this method the friction tape may be quickly wrapped back over rubber tape, holding it in place and preventing any tendency to unwrap. W. S. Doxsey.

Another Simple Fixture Hanger.

Another simple fixture hanger consists of a three-inch piece of one-half-inch conduit threaded on one end far enough to enable a locknut to hold the outlet box, and with a quarter-inch hole bored in the other end, through which a stove bolt is placed, holding the perforated iron in place. The perforated iron is bent around the conduit as shown in the diagram. The perforated iron rests on

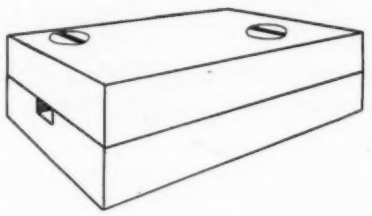


Two Views of Simple Fixture Hanger.

the lath above the outlet; the outlet box is slipped over the conduit with the locknut holding it in place. This hanger is simple and cheap. E. Kemp.

Keeping Square Wire Straight.

When winding square wire into coils, there is frequently a tendency for the wire to twist around its own axis, preventing the wire from lying as closely together as it should, thus defeating the purpose for which it is used. An in-

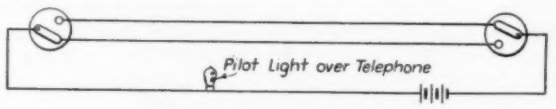


Block for Use in Winding Square Wire.

expensive holder made to prevent this twisting is shown in the sketch. It consists of two pieces of hard wood or fiber, held together by flat-head screws. The lower block has a slot in its upper surface into which the wire fits closely but free enough to prevent chafing. R. L. Hervey.

Pilot Light for Telephone.

The accompanying diagram shows how to wire a small night light over a telephone. It is controlled by means of two three-way switches made from ordinary two-point battery switches. By throwing the lever from one point to the other when lighting or turning the light off it will be observed that there is obtained the same control as by use of regular three-way lighting switches, so that this

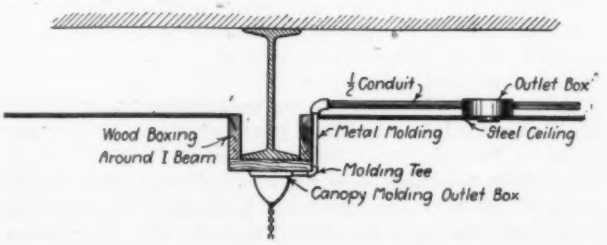


Pilot Light for Telephone.

small lamp can be turned on or off from two places, say, from the bedroom and near the telephone. W. Morris.

Changing Outlet on Steel Ceiling.

In wiring stores and offices which are provided with steel ceilings, it is frequently necessary to change a lighting outlet. Such a case is shown in the accompanying diagram. It was required to change the outlet from the outlet box provided to a point directly below an I-beam. The manner in which this was done is quite well shown. Metal molding was used because the use of conduit around the short bends below the I-beam was impracticable. Half-inch conduit was run from the outlet box to a coupling connecting to the molding, and a molding ell with a canopy type molding outlet box was used. The molding side of the coupling just protruded below the cove in the steel ceiling. This particular case came up where two rooms were made into one, and it was required to have an outlet directly under the beam. J. B. Story.



Running Outlet Under I-Beam.

CORRESPONDENCE AND DISCUSSION

A Reader's Page Wherein Opinions on Topics of General Interest May Be Expressed

On the Alleged Germicidal Value of the Electric Current in Laundry Practice.

To the Editor:

Many remarkable things have been accomplished in the application of electricity to scientific and industrial uses. In fact, the application of electricity has given us such a maze of impressive innovations that, in the argument of the sophist, there is nothing which may not be effected by its aid. It is only to be expected, therefore, that to the lay mind the word "electric" has come to be a word to conjure with.

Unfortunately, however, there have been advanced, from time to time, claims regarding the application of electricity which are untenable in the light of scientific knowledge.

One of these has come very forcibly to the attention of the writer of this note. This is the claim that by passing a current of electricity through water, sterilization of the water is accomplished and that the electric current passed through the water of a washing machine may be used to advantage in the laundering of soiled clothes.

The claim that a liquid can be sterilized by the passage of an electric current through it, is denied by every authoritative investigator whose work has been reported in the literature. An argument which, at first thought, would appear to refute this statement is the fact that many municipal water supplies and swimming pools are purified by electrical means. When this application is examined, however, we find that the bacterial count for the water in question is reduced by passing into it sodium hypochlorite which has been made by the electrolysis of salt solution. It is by the well known action of sodium hypochlorite that the reduction of bacterial life is effected, and the result is accomplished just as effectively when this germicidal reagent is prepared by another method.

In order to confirm the evidence in the literature that the electric current is not germicidal, the following experiments were made in the laboratories of the Mellon Institute. Recognizing that chemicals of a strongly oxidizing action, or acid or alkaline reaction, are destructive to bacterial life, a salt was chosen for the electrolyte which would not, by electrolysis, produce a substance of this nature. The salt selected was sodium sulfate. 150 cubic centimeters of pure water in a 300-cubic-centimeter glass beaker were used with varying amounts of sodium sulfate. The platinum electrodes used had an area of two square centimeters and these were placed six centimeters apart. *B. Mycoides* were planted, mechanical agitation was provided, and then there was applied current that would pass through a 16-candlepower carbon lamp from a 110-volt, direct-current circuit. After a run of two hours the usual test showed no reduction in bacterial count.

Tests similar to that above mentioned, in which the current density was varied and platinum electrodes were changed to aluminum ones of greater area, showed, in no case, any observable bactericidal action.

The results of this series of tests are confirmed by the work of R. D. Scott, of the Ohio State Board of Health (*Ohio Public Health Journal* (1916), Vol. 7, pages 32-4). Hence it is concluded, in agreement with other investigators, that electric current of ordinary densities (that is, densities below which the resultant heating of the electrolyte would effect pasteurization) has no germicidal action.

Regarding the claim that the electric current, when passed through the water of a washing machine, may be used to advantage in the laundering of soiled clothes, consideration must be given to the fact that any possible advantages must be either in the germicidal action of the current *per se* or in some detergent substance formed by the electrolysis of the salts in the washing bath. The first possibility is, of course, eliminated by the experiments just described. Since those supporting the second claim mention the use of salt to produce chlorine bleach (for example, see United States Patent 1,059,071) the first test was to determine whether sodium hypochlorite would be produced by an arrangement of electrodes in either end of a washing machine. Aluminum electrodes, or electrodes of aluminum and lead alloys, were mentioned in the claims. Experience in electrochemistry indicates that, with electrodes so placed and current densities as suggested (one-half to one ampere), only a negligible amount of hypochlorite or available chlorine would be formed, even if electrodes of platinum, etc., or carbon were used. If other electrodes were used, a prior knowledge would indicate that no available chlorine would be formed, because the available oxidizing power would be spent on the anode.

Accordingly a wooden tank, 12 by 12 by 54 inches, was made, the length being such that the distance between the electrodes would be comparable to that in an ordinary power laundry washing machine. Aluminum electrodes of a wetted area of 6 by 7 inches each were placed in either end. The tank was half filled with water and one pound of salt was then dissolved therein. Two amperes from a 110-volt direct current line was passed through. There resulted an acid solution around the anode (hydrogen gas and no available chlorine) and around the cathode an alkaline solution and hydrogen gas. It is noteworthy that hydrogen gas was produced at each pole. With carbon electrodes placed as in the above test, a small amount of available chlorine could be detected at and near the anode. Even if a washing machine were provided with electrodes of carbon or platinum, there would result only a small amount of available chlorine in the region of the anode and none in the region of the cathode.

It may be concluded that there is no advantage to be obtained by passing a current through the wash water of a clothes-washing machine. The electric current *yper se* is not germicidal, although it may be utilized in the production of germicidal chemical compounds.

H. G. Elledge,

Pittsburgh, Pa. *Mellon Institute of Industrial Research.*

Contract Rates Held Discriminatory.

In quoting business customers a lower rate on contracts than on month-to-month payments, the Washington Water Power Company, of Spokane, Wash., is "practicing discrimination", according to a ruling of Chairman A. A. Lewis, of the State Public Service Commission. The new-business rates now quoted by the company which have not been filed with the Commission, are seven cents for the first 30 kilowatt hours; three cents for all energy over this amount, and a 25-per cent discount is given to contract holders, while non-contract holders do not receive this discount. The Commission further rules that if the company filed schedules making a distinction between contract and non-contract rates, it could legally make such rates, but until the tariffs are issued the practice is illegal.

QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to 300 words. Payment will be made for all answers published.

Questions.

No. 355.—Special Lighting Districts.—In what states, if any, is it possible to form lighting districts for the special purpose of providing more liberal or more ornamental street lighting by special assessment of all the property owners along the streets so lighted? What procedure is followed in organizing such a district? How does the plan work out in districts already established?—S. G., Yonkers, N. Y.

No. 357.—Changing Fan Motor.—What will I have to do to change a fan motor built for 104 volts, 75 watts, 16,000 alternations per minute (133 cycles) to make same operate on 110 volts, 60 cycles?—H. S. G., Watertown, N. Y.

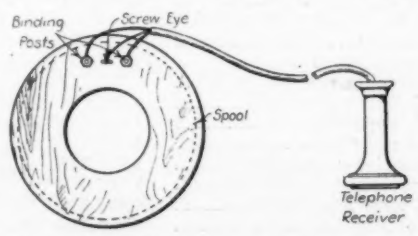
No. 358.—Reactance Coil.—I desire to construct a reactance coil to operate in series with a resistance of 10 ohms on a 220-volt, 60-cycle circuit. I want to vary the current in the circuit from 10 amperes to about 22 amperes by adjusting the iron core in the reactance coil. I have an iron core 4 inches square by 12 inches long made of 0.014-inch sheet iron. Should like to know what size and how many turns of wire to place on this core to get the required voltage drop when 10 amperes is flowing through the circuit, also formulas and methods used in calculating the number of turns of wire.—L. H. W., Cincinnati, O.

No. 359.—Change in Induction Motor.—A 30-horsepower, 440-volt, 60-cycle, two-phase induction motor running at 850 revolutions per minute at full load was changed to meet an emergency so as to operate as a three-phase, 220-volt motor. The coils themselves were not disturbed, only the cross connections and grouping being changed. The speed was intended to be the same, but it appears that it is somewhat lower, that is, there is greater slip at full load. The load may be more than rated full load, however, though there is no ready means of ascertaining this. What are the probable effects of this change as to efficiency, power-factor, and speed or slip?—R. D., Washington, D. C.

Answers.

No. 351.—Annunciator Trouble.—I have some trouble with an automatic set-back annunciator system in a fine residence. It has a ground, but I do not want to take up any floors or tear into walls to find it. Could someone suggest a simple way to locate this ground and some way to overcome the trouble? There are steam pipes and gas pipes in the house.—R. L. G., Reynolda, N. C.

In answer to this question and also to any other trouble in the nature of grounds or short-circuits, where the source of trouble cannot be seen, I find the instrument herewith illustrated very valuable. Cut a circular board seven-eighths inch thick and 6 inches in diameter, with a hole in center 3 inches in diameter, and a groove one-half inch wide and three-fourths inch deep in the outside edge. Wind in this groove insulated wire from off a common buzzer or bell magnets, or wire the size of same. When spool is full, attach the terminal wires to binding posts, which have been set on the side of spool. Then cut in a common buzzer and battery on line, either for ground or short, so as to make a circuit to get the buzzer in action; attach an ordinary telephone receiver to binding posts of spool, and then follow the line. As long as one can hear the vibration of the buzzer, one will know that the line is clear, but when vibration is no longer heard, open up to reach the line at that place, and trouble will be located.—J. W. S., White Sulphur Springs, W. Va.



No. 351.—Test Coil for Locating Trouble.

No. 353.—Motor Wiring in Forge Shop.—In a large forge shop there are to be installed numerous 440-volt, 25-cycle, three-phase motors for driving drop hammers, upsetters, shears and trimming presses, the equipment comprising the following motors: one each of 2, 3, 10, 35 and 75 horsepower, two of 50 horsepower, three of 25 horsepower, and four of 20 horsepower. (a) What is the best type of motor and starting equipment to use in this case? (b) What size wire should be used for the main line? (c) Which would be best, a main line run through the center of the shop with outlet boxes for branch circuits to the motors, or a distributing panel with an individual branch to each motor?—R. B., Jackson, Mich.

(a) The type of motor to be used would undoubtedly be the squirrel-cage type induction motor, as it is assumed that all the machines are to be driven at constant speed. Up to and including five horsepower, it is common practice to use either a three-pole fused double-throw switch, whereby on one side the motor is connected directly to the line and on the other the running fuses are in circuit, or a three-pole fused single-throw switch may be used. Some companies use a three-pole oil-immersed switch with overload relays and no-voltage release; this type of switch is very safe to use in shops of this character as all live parts are inclosed. Above five horsepower starting compensators should be used; with their use gradual starting of motors is obtained and line disturbance is greatly reduced. Fuses or overload relays may be used to protect the motor against overload, all compensators having a no-voltage release arranged to disconnect the motor from the line in case of voltage failure.

(b) As no distance is given it is hardly possible to give the size of wire required. One way to determine same is to compute the load in amperes, add to that 2.5 to 3 times the starting current of the largest motor; the size wire is then found as in ordinary wiring calculations, when length, amperes to be carried, and volts drop are given.

(c) A distributing panel with a branch to each motor would be the best, if first cost is not limited. But if a cheaper installation is required one or even two sets of mains each taking one-half of the shop may be run exposed on insulators. Triple-braid, white, slow-burning wire may be used, taps being taken wherever needed.—J. H. L., North Cambridge, Mass.

(a) For the work in question, the squirrel-cage motor would be by far the best. It has the best power-factor of the induction motors and enough starting torque to start the machines. If these were to be started and stopped often during the day, the wound-rotor type would be best. So if any of the machines were to be started and stopped often and had large flywheels, the wound-rotor motor should be used, the squirrel-cage motor in all other cases.

(b and c) If a main power line was to be run for these motors, 500,000-circular-mil cable would have to be used. If possible, the higher voltage should be brought near to the center of the group of machines and then stepped down by the transformers. If the power is to be brought a considerable distance at the 440-volt potential, a main line down the shop with branch outlets for the motors would be best, while with a short distance of the supply, the individual wiring to each motor would be the most economical in the end. Definite instructions can not be given without knowing the distances and locations of machinery and power supply and power costs.—L. M. D., Pittsburgh, Pa.

No. 354.—Demagnetizing Tool Steel.—Please let me know through the Questions and Answers Department how I can

demagnetize pieces of tool steel that have become magnetized while working them in a magnetic chuck.—H. J. G., New York City.

In all probability the pieces of steel in this case are not highly magnetized. The most ready treatment therefore will be to anneal them, since heating to a moderately high temperature destroys the magnetization. If annealing is a step in the process of finishing the tools, no further treatment is necessary. If the material is high-speed tool steel, its heating in use will destroy the magnetization. Should there be objection to heating the steel, an alterating-current demagnetizing coil would be best. Any available frequency can be used and the voltage should be such as to make the coil a strong solenoid. Place the steel pieces within the hollow core of the coil, apply the current strongly and then gradually reduce it to zero by cutting resistance or reactance in series with the coil. If no ready means for cutting down the current are available, arrange the steel pieces so that they are gradually withdrawn from the core and the magnetic field about the coil, the current in the latter being kept constant. Should only direct current be available, it would be necessary to arrange a strong magnetic field, probably best in the form of a horseshoe magnet or double-coil electromagnet with its poles exposed. Revolve the pieces of steel end for end (not about their long axis) above the exposed poles so that the magnetism in the steel pieces is continually reversed; at the same time gradually raise the pieces so as to remove them steadily from the magnetic field. Test with a compass or unmagnetized iron chips or tacks to see whether the magnetism is entirely removed.—B. F., Muskegon, Mich.

No. 356.—MERCURY RECTIFIERS ON SINGLE-PHASE-DIRECT-CURRENT LOCOMOTIVES.—Some time ago I read of a locomotive that was being experimented with to show the practicability of operating on a single-phase trolley line, the current being rectified for the motors through mercury-arc rectifiers carried on the locomotive. What was the result of these trials? Has this system been put into practical use?—H. S. J., St. Louis, Mo.

The locomotive in question was purely experimental and no data on its operation are available at the present time for publication. However, a somewhat modified arrangement has been and is in continual use by the Michigan United Traction Company, at Jackson, Mich. A group of metallic rectifiers is installed at a substation and supplied with alternating current so as to rectify it and feed direct current at 5,000 volts to the trolley line. The car on this line has direct-current double-armature motors wound for 2,400 volts and connected two in series on the 5,000-volt line. This system has been in successful operation over 14 months. It was described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of October 23, 1915, pages 774-777.—M. C. T., East Pittsburgh, Pa.

Head of Cities Service Company Gives Views as to Future of Electrical Industry.

In a recent interview, Frank W. Frueauff, vice-president of Cities Service Company, cited his opinion as to the outlook and avenues of possible growth in public utilities. Mr. Frueauff's views are given below:

"Growth in electrical power includes power for heating purposes. Lighting used to be the big thing, but now the power business is leaving it behind. Wherever there is an elevator to be lifted or a printing press run, electric power is stepping in to do the work. Electrical power, eventually, will move everything. To sell electric power in days not long past used to be a matter of salesmanship. Now, with a central station in the neighborhood of any community in the country that shows signs of expanding, electric power is being sought by every efficient plant, whatever its nature. Not long ago central stations considered themselves fortunate to have a 30 to 35 per cent load-factor. Now they are not content with 60 per cent and are looking toward 70 per cent.

"Tractions will always be good and they will always grow, but the rate will be very slow matched against that in the power field. Trolley lines, too, have to contend not only with the jitney, but with the privately owned automobile. All over the country are people who own cheap cars, and they cut down traction revenues enormously in the aggregate.

"What has helped public utility growth is the industry's stable earning rate. Business depression has not had the effect on utility companies it has had on industrial concerns. As a result investors and banks are looking more favorably toward utility securities.

"In towns throughout the country the growth of the power load has outdistanced the growth in population. In a given time a town whose population has increased 10 per cent has seen the power load of the nearby central station expand around 50 per cent.

"Big manufacturing enterprises have all they can do to concentrate on the production of their particular products. Take the Willys-Overland plant in Toledo. That company's business is to turn out cars and to it all its energies are devoted. Furnishing power to run the plant is our business and we expend all our energies in doing that.

"This fall should witness excellent increases in power output and revenues in most sections of the country, and from the power inquiries we receive this expansion is going to occur in places where war orders are not a factor."

Value of Products of American Electrical Manufacturers.

The total value of products of the electrical-machinery industry in the United States increased practically 50 per cent between 1909 and 1914. A summary of the census of manufacturers for that industry in 1914 has been issued by the United States Bureau of the Census. The total number of establishments decreased by 30 in the five-year period, from 1,151 to 1,121; but, eliminating those which make electrical machinery as a subsidiary product, the total number engaged primarily in this industry increased by 21.

Of the 1,121 establishments reported for 1914, 234 were located in New York, 151 in Illinois, 129 in Ohio, 114 in Pennsylvania, 100 in Massachusetts, 83 in New Jersey, 46 in Connecticut, 46 in Indiana, 30 in California, 19 in Missouri, 18 in Minnesota, 17 in Rhode Island, 8 in Colorado, 7 in Maryland, 6 in New Hampshire, 5 in Iowa, 4 each in Delaware, North Carolina, Tennessee, Washington, and West Virginia, 3 in Kentucky, 2 each in District of Columbia, Louisiana, Nebraska, and Vermont, and 1 each in Alabama, Kansas, Oregon, South Carolina, Texas, and Virginia.

The comparative statistics for 1914 and 1909 are summarized in the following statement of values of products:

Products	1909	1914
Dynamos	$ 17,231,804	$ 23,233,437
Transformers	8,801,019	13,120,065
Motors	32,087,482	44,176,235
Batteries, parts and supplies	10,612,470	23,402,455
Carbons (including furnace, lighting, brushes, battery, etc.)	1,934,864	3,602,741
Arc lamps	1,706,959	742,142
Searchlights, projectors, and focusing lamps	935,874	2,081,545
Incandescent lamps	15,714,809	17,350,385
Sockets, receptacles, bases, etc.	4,521,729	5,512,609
Electric lighting fixtures	2,200,668	3,383,955
Telegraph apparatus	1,957,432	2,248,375
Telephone apparatus	14,259,357	22,815,640
Electric heating apparatus	1,954,112	4,034,436
Electric measuring instruments	7,800,010	8,786,506
Insulated wire and cables	51,624,737	69,505,573
Other products	66,694,153	115,416,577
Total	$240,037,479	$359,412,676

NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Tank Lifters for Medium-Size Oil Switches.

The General Electric Company, Schenactady, N. Y., has recently developed a number of tank-lifting arrangements for oil switches of various forms and sizes. Lifters for small switches were described in issue of July 31, 1915.

For switches of the next larger size and in capactities

Tank Lifter for Oil Switches.

up to 1,500 amperes, the lifter as herewith illustrated is employed. The simplicity of construction is evident from the illustration. The oil tanks can be lifted the entire distance between switch frame and the floor.

The method of removing an oil tank is as follows. The lifter is placed on the oil-switch frame and fastened there by turning two wing nuts; the operating handle, connected to a worm gear, is turned until the two triangular tank supports engage the tank, which is then unfastened from the switch frame and lowered to the floor or to any intermediate position desired.

The lifter is adapted to various sizes of the form of switch shown simply by moving slightly forward or back the pulleys over which the cables run, depending upon whether the switch on which the lifter was last used is smaller or larger than the switch next to use it.

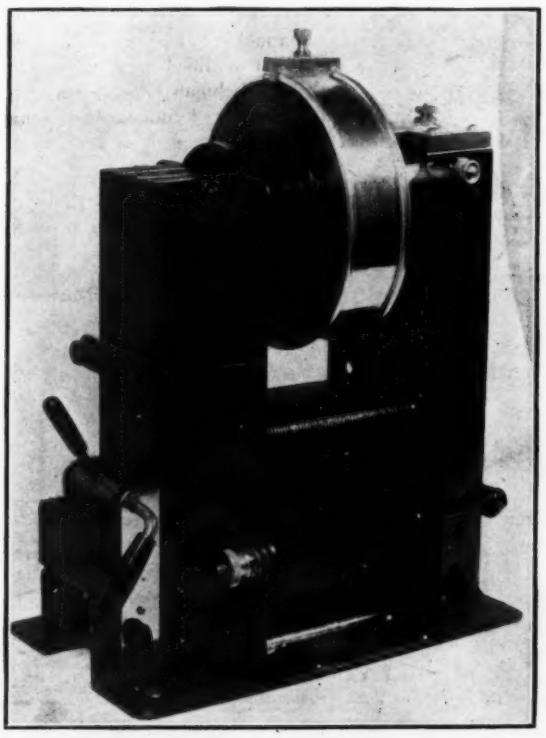
A Correction.

In our issue of July 29 on page 216 we referred to the Hart Manufacturing Company, Hartford, Conn., as exhibitors of a 110-volt hospital signal system and Spartan interchangeable plugs and receptacles at the convention of the National Electrical Contractors convention in New York, July 18 to 22. This was in error as the equipment referred to is manufactured and was exhibited by the Bryant Electric Company, Bridgeport, Conn. The exhibit of the Hart Manufacturing Company comprised a full line of "Diamond H" push-button switches, receptacles and wiring devices.

Thordarson Wireless Transformer.

Thordarson Electric Manufacturing Company, Chicago, Ill., has recently put on the market a new type of wireless transformer for the use of small wireless stations. It is built chiefly in sizes of 0.5, 0.75 and 1 kilowatt. Mr. Thordarson designed a wireless transformer over six years ago that is said to have received the biggest sale of any type of transformer manufactured in this country for amateur and small wireless stations. This transformer is well known to wireless operators.

The new design of wireless transformer has several mechanical, electrical and magnetic features that are great improvements over previous designs. The dry-air-insulated construction of the old design has been adhered to. From a mechanical standpoint, the advantages of this transformer are that all castings have been eliminated and the framework is built of formed sheet steel and brass. This makes the construction nonbreakable and reduces the weight nearly 20 per cent. Also, as the steel has a smaller cross-section, the eddy currents in the frame have been reduced and, therefore, the efficiency increased. The same principle as used on previous transformers has here been adhered to in the magnetic circuit, namely, having an external magnetic shunt, with the important difference,



New Thordarson Wireless Transformer.

however, that instead of moving the entire magnetic shunt at one end with spring and screw, the magnetic shunt is rigidly secured and stationary and the intensity of the magnetic field around the magnetic shunt is varied by means

of a V-shaped laminated steel tongue moving in the air gap, thereby adjusting the width of the air gap. This is done by means of two gear wheels that grip on each side of the tongue. Also on the same gear shaft is placed a cam that readily locks the tongue in any position. In fact this cam locks the tongue so effectively that it is practically silent in all positions. An adjustment with so little noise is extremely difficult to obtain by mechanism that moves the entire magnetic shunt. This tongue is graduated so that the air gap can be readily read and adjusted for any current input desired.

The secondary of this transformer is one circular coil that is mounted on the upper yoke of the magnetic circuit. It is well protected mechanically by a heavy metal band that covers the outer surface. This band is turned over circular on its edges, thereby eliminating corona, which in turn reduces the liability of flashing over the surface of the coil.

The high-tension coil is carefully wound in layers with special insulating paper between each layer, this paper being folded back on the edges, thereby preventing the wires from slipping out of place. This construction was patented by Mr. Thordarson several years ago. The outer metal band also serves as a terminal of the high-tension coil, thereby eliminating high-tension cable and high-tension insulators. Everyone who sees this transformer is impressed with its neatness, simplicity and rigidity of construction. By eliminating all springs and adjusting screws the construction has been greatly simplified and the transformer becomes less liable to break or get out of order. The high-tension coil being impregnated, it is practically moisture-proof. To prove this fact, one of these transformers was immersed in a pail of water and after being taken out the faces of the high-tension coil were wiped with waste and the transformer, when tested, did not indicate any insulation weakness.

The Crystal Washing Machine.

The accompanying illustration shows the Crystal electric

New Crystal Electric Washing Machine With Swinging Wringer.

washing machine, which is being placed on the market by the Crystal Washing Machine Company, Detroit, Mich., and which was awarded a gold medal at the Panama-Pacific International Exposition. The machine illustrated is known as Model 5 and is of metal construction throughout. The tank is made of galvanized iron and the cylinder of yellow poplar and zinc. The ends are made in one piece and the strips are grooved into the wood preventing any warping or opening up of the cylinder. The inside of the cylinder is constructed so as to reverse the clothes in the cylinder, which revolves in one direction only. All metal parts subject to rust that come into contact with clothes or water have been sherardized, making them absolutely rustproof.

The motor is of special design, splashproof, and fully protected against moisture. The wringer is of standard make equipped with ball bearings and inclosed gears. It has a special safety release device which removes all pressure from the wringer rolls immediately in any emergency. As will be noted in the illustration, the wringer will reverse and will also swing into any position enabling the operator to handle the laundry quickly and conveniently.

One of the features of the Crystal machine is its safety features, every moving part being entirely inclosed. The Model 5 machine has a capacity of eight sheets.

Two-Speed Alternating-Current Elevator Motor.

The two-speed alternating-current elevator motor illustrated herewith is designed for operating high-speed elevators. Until recently the speed of the car for an alternating-current elevator equipment was limited to 200 or 250 feet a minute owing to the necessity of using a single-speed motor. This limitation of speed was due to the fact that in slowing down for a stop, an alternating-current equipment with a single-speed motor had to be stopped by a mechanical brake. On a direct-current outfit with field control, slow down and dynamic braking are employed. By the use of the two-speed alternating-current motor a car speed of 400 feet a minute is now possible, and starting and stopping is accomplished as smoothly as with an equipment driven by a direct-current motor.

The unique feature of this two-speed alternating-current motor, which is made by the Westinghouse Electric & Manufacturing Company, is the use of the separate windings in both stator and rotor. Mechanically, the construction of this type of motor is the same as that of the standard single-speed type CI elevator motors made by the same company. Special attention has been paid to securing the quiet operation essential for apartment-house, hotel, and office-building service. The motor develops a high torque at low speed with a starting current only 50 per cent. above the current at full speed with full load.

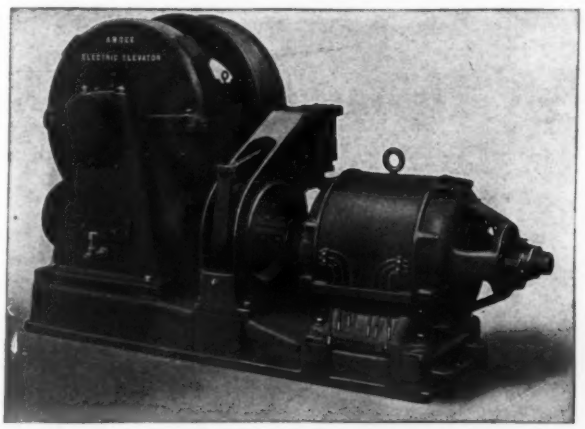
For starting, a 24-pole connection is used, giving a motor speed of 250 revolutions per minute. When the motor attains sufficient speed the connections are changed to give eight poles, and the motor then comes up to a speed of about 750 revolutions per minute. In slowing down, the 24-pole connection is again employed. At the instant this is done, the motor is running at a higher speed than the synchronous speed for this connection. As an induction motor driven above synchronism acts as a generator, this produces an electrical braking action that quickly brings the motor speed down to synchronism. Then by disconnecting the motor from the line and applying an electrically operated mechanical brake, the car is easily brought to rest. Both rotor windings are connected to the same slip rings so that only three collector rings are necessary. In operation, the eight-pole stator connection is made and the 24-pole winding is only active when the stator is connected for 24 poles.

This line of two-speed alternating-current elevator motors permits the use of alternating current for high-speed elevator service, and eliminates the loss in transformation,

Two-Speed Alternating-Current Motor for Elevator Service.

heretofore necessary, where direct current is not furnished by the central station. The standard sizes of these motors are 25, 30, 35, and 40 horsepower.

The controller employed consists of a number of magnetically operated switches and relays mounted on a slate panel and operated by a car switch located in the elevator car. When the car switch is thrown to either the full up or down position the controller connects the low-speed motor winding to the line with resistance in the rotor circuit. As the motor accelerates, this resistance is automatically cut out by magnet switches, whose rate of operation is controlled by series current-limit relays, bringing the motor up to the full speed of the low-speed winding.



Two-Speed Alternating-Current Motor Connected to Elevator Machine.

A change-over switch then closes, opening the low-speed winding and impressing voltage on the high-speed winding with resistance in the rotor circuit. This transition is made so smoothly that it cannot be sensed in the elevator car. The resistance is then cut out automatically as above, bringing the motor and car to full speed. Both acceleration and retardation are accomplished smoothly, without any shock or jar in the car. The car switch provides for two running speeds in each direction. The same safety devices, such as hatchway and car-limit switches, slack-cable switches, and emergency car switch, that are used with high-speed elevators driven by direct-current motors, can also be used with this equipment.

Electric Mine Lamps.

The Bureau of Mines, Washington, D. C., has published a list of approved permissible portable electric mine lamps. The lamps listed below have passed the tests which were specified by the engineers of the Bureau as being necessary for equipment that is to be used in gaseous and dusty mines.

Approval No. 10 covers a permissible portable electric mine lamp manufactured by the Edison Storage Battery Company, Orange, N. J. The only bulbs approved for use with this lamp are the symbol 26-V bulbs manufactured by the Independent Lamp & Wire Company, 1737 Broadway, New York, N. Y.; the symbol BM-10 bulbs manufactured by the National Lamp Works of the General Electric Company, Cleveland, O., and the symbol BM-10 bulbs manufactured by the Edison Works of the General Electric Company, Harrison, N. J.

Approval No. 11 covers a permissible portable electric mine lamp manufactured by the Mannesman Light Company of America, 16 Pike Street, Tompkinsville, Staten Island, N. Y. The only bulbs approved for use with these lamps are the symbol C-5 bulbs sold by the Mannesman Light Company of America.

Approval No. 12 covers the Concordia permissible portable electric mine lamp manufactured by the Concordia Safety Lamp Company, Fulton Building, Pittsburgh, Pa. The only bulbs approved for use with these lamps are the symbol Osram 08510 bulbs sold by the Concordia Safety Lamp Company.

New Type of Globe Electric Range.

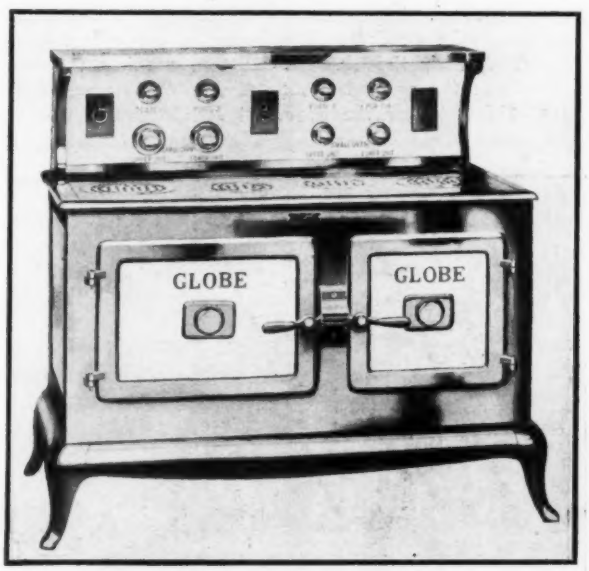
A firm belief in electric ranges of the utmost simplicity has prompted the Globe Stove & Range Company, of Kokomo, Ind., to announce a new model of its large double-oven type of electric range.

The most important improvement noted is the elimination of the thermostat—a source of frequent trouble to the housewife, and an attachment entirely unnecessary on a modern electric range, according to the Globe company.

The main switch and pilot light have also been discarded, and the parts of the stove demanding constant use and attention by the housewife, have been reduced thereby.

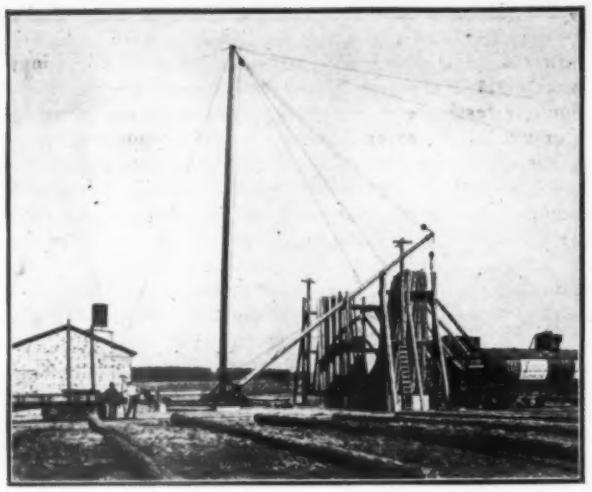
A push-button switch controlling the two lamp-socket receptacles and tubular lamp has been placed in an advantageous location.

Anchor connections at the rear allow the two castings comprising the top of the stove to be raised and lowered at will for inspection and repairs.

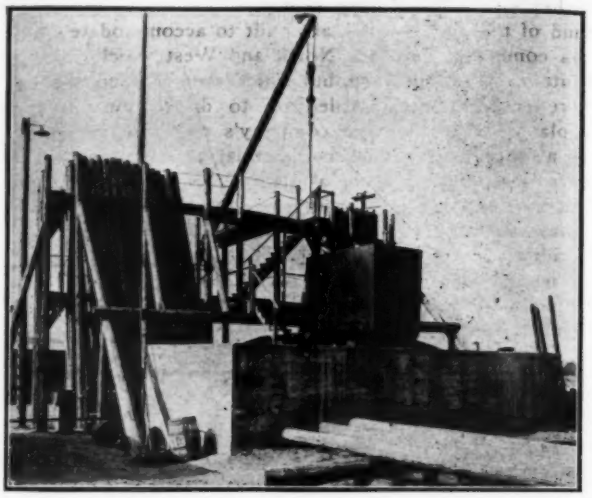


New Double-Oven Electric Range.

The new base casting and legs give a finish and pleasing appearance to this new model which is borne out by various other refinements in many places.



Pole-Treating Tanks of Lindsley Brothers at Minneapolis.



Rear View of Storage Tanks, Showing Concrete Construction.

New Pole-Treating Plant of Lindsley Company.

The Lindsley Brothers Company, of Spokane and Minneapolis, pioneer cedar-pole manufacturer, has recently completed a $15,000 pole-treating plant, at its Minneapolis yards, that embodies many features of interest. It consists of two large treating tanks, each 10 feet by 18 feet by 11 feet deep, and two large storage tanks, each 14 feet by 14 feet by 14 feet. As will be noted in the accompanying views, the two large treating tanks are set at a slight angle from each other. Just between the two large tanks, directly underneath the platform on which one of the men is standing, is a small triangular treating tank built for the short-time treatment under the specifications "A" and "AA."

Between the two large storage tanks is a smaller storage tank, 4 feet wide by 14 feet long by 14 feet deep. This tank is meant for the storing of carbolineum, but it is also equipped with steam coils to be used as an auxiliary heating tank for creosote.

Between the treating tanks and the storage tanks there is a chamber or pit about 10 feet by 10 feet in cross section and about 9 feet deep. The top of this pit is flush with the ground. The treating tanks are set 8 feet in the ground and the concrete extends about three feet above the ground with the timbers on top, making the total height above the ground about 4 feet. The storage tanks are set 7 feet below the ground level, leaving 7 feet exposed above.

Each of the treating tanks has a system of steam coils in the bottom of it, used in heating the oil during the process of treatment.

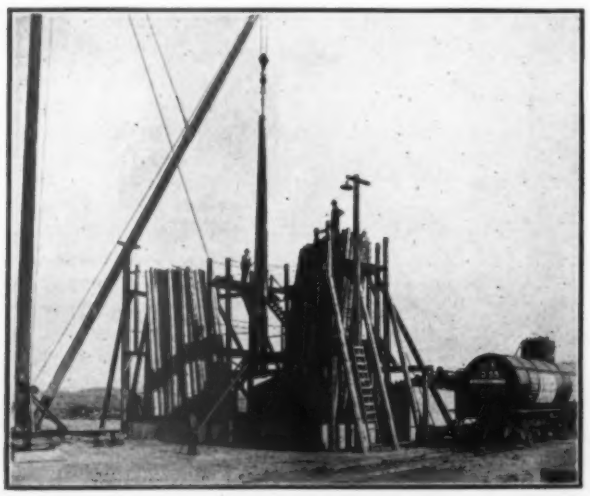
In the pit between the storage tanks and the treating tanks is located the steam pump for handling the oil, and also a water pump operated by a gasoline engine for pumping water into the storage tank shown on top of the two oil-storage tanks in the picture taken from the rear of the plant. In this pit also is a system of valves so arranged that oil can be pumped directly from any one tank into any other tank. In addition to these combinations oil can be pumped from the tank cars into either the storage tanks, or if necessary directly into the treating tank.

The two large storage tanks have a capacity each of 20,000 gallons, which can be augmented if necessary by the small storage tank with its capacity of 4,000 gallons.

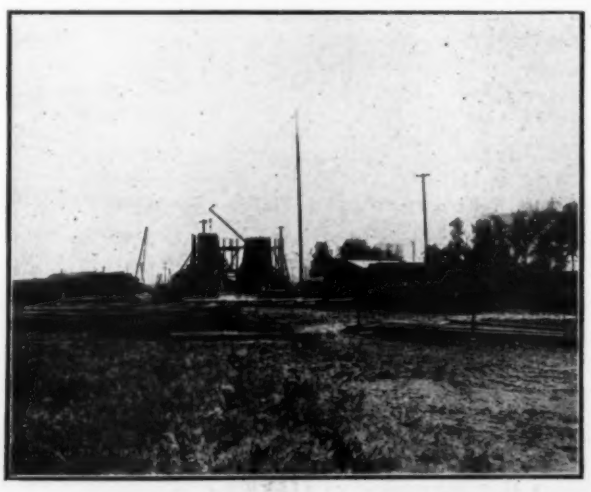
Each of the treating tanks will hold at least one carload of poles at each charge. The normal capacity will be about four carloads of poles, "B" treated, per day, but this could be increased to about six if necessary.

The plant is built of concrete throughout and it is said to be the only concrete treating plant in the country today. Furthermore it has the largest capacity of any now in operation according to the company.

Two spur tracks running the full length of the yard, connected by switch on both ends, are located on either side of the plant, enabling the poles to be loaded or unloaded



Poles in Process of Treatment.



Portion of Yard with Tanks in Distance.

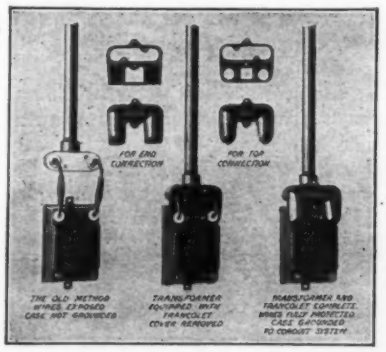
at either side. The empty skidways, shown in the foreground of the photographs, are built to accommodate shipments coming in from the North and West which are not put into stock at this yard, but which are unloaded, treated and re-loaded and forwarded on to destination. While this plant is built for the company's own use primarily, it is also planned to do commercial treating for other dealers who do not have a plant of their own, or for public service companies who prefer to place their order and have the treating done for themselves.

In addition to this plant the company has a small plant at Priest River, Idaho, and another at Nakusp, British Columbia. These two small plants will handle about one carload of poles, "B" treated, per day. In addition to this there is now building at Sandpoint, Idaho, another large plant which will give an additional four cars per day, or a total of 10 cars, "B" treated, poles per day if necessary.

New Fitting for Connecting Bell-Ringing Transformers and Conduit.

A new fitting designed for use with bell-ringing transformers when installed in connection with pipe installations has recently been placed upon the market by the Dongan Electric Manufacturing Company, Detroit, Mich.

When bell-ringing transformers are installed on conduit systems it has been necessary to leave the primary leads between the transformer and the service outlet exposed. By use of the new fitting, called the "Trancolet," these wires are completely covered. The Trancolet consists of two



Special Fitting for Bell-Ringing Transformers.

parts, a base designed to screw onto a standard outlet fitting and the transformer, and a cap to cover same. The base is apertured to correspond with the opening of the outlet fitting. When installed the base is first screwed to the transformer and the fitting; the joint is then made with the service, after which the cap is screwed in place.

Besides affording absolute protection for the wiring, the Trancolet insures a permanent ground for the transformer case. The new device is approved by the National Board of Fire Underwriters.

Testing Equipment for High-Frequency Tests of Insulators for Busbar Supports, Disconnecting Switches, Etc.

It has been known for some time that insulators fail almost entirely from abnormal stresses of high-frequency lightning discharges, arcing grounds, line surges, etc. It has also been found that high-frequency tests show up weak spots or units in insulators or insulating materials much more quickly and reliably than any tests, even at excess potentials, at normal frequencies. Consequently, insulators that have passed a high-frequency test are much more dependable because they have shown their ability to withstand the abnormally severe strains corresponding to rapid-fire hammer blows that high frequency imposes on them.

With this idea in mind the General Devices & Fittings Company, 817 Washington Boulevard, Chicago, is installing a complete testing equipment by means of which every insulator used in its extensive line of busbar supports, bushings, disconnecting switches, etc., will be subjected to a high-voltage test at 200,000 cycles per second. This high frequency is obtained by means of a special testing set made by the American Transformer Company, Newark, N. J. As shown in the accompanying illustration, this is a compact and self-contained apparatus that includes a 60-cycle transformer stepping up the 220-volt primary current to about 12,000 volts, a reactance in the primary circuit, a rotary spark gap across the secondary circuit, a group of condensers in series with the secondary, an oscillating transformer supplied by the secondary and in turn furnishing the high-frequency, high-voltage current to the test circuit, and an adjustable sphere gap at the top for regulating the test voltage. This equipment is conveniently arranged for rapid testing work. As set up, the primary

Testing Set for High-Voltage Tests at 200,000 Cycles.

current is supplied by a special belt-driven, 60-cycle generator which is excited from the Edison direct-current mains. In this way no inductive disturbances can be imposed on the Edison supply circuits from the high-frequency equipment.

Testing with this apparatus affords not only a positive means for weeding out any defective insulators, but also produces many strikingly beautiful corona, brush-discharge and flashover effects. The insulators are tested singly or in groups up to about ten. The voltage applied depends on the pressure for which the insulator is designed, being in any case many times this value. The equipment is capable of developing easily up to 150,000 volts. Every device and fitting produced in the factory is now subjected to the high-frequency test before being passed for shipment.

The products of the General Devices & Fittings Company, some of which were described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of October 16, 1915, are being used in many generating stations and substations by leading centralation companies.

INDUSTRY ACTIVITIES

Harvey Hubbell, Incorporated, Bridgeport, Conn., has issued Bulletin No. 15-16, a catalog sheet descriptive of new Hubbell steel reflectors.

Sangamo Electric Company, Springfield, Ill., has issued Bulletin No. 44, on mercury-type, direct-current watthour meters for two-wire and three-wire service.

Naugle Pole & Tie Company, 5 South Wabash avenue, Chicago, Ill., is sending out mailing cards calling attention to its facilities for quick delivery on poles.

Crouse-Hinds Company, Syracuse, N. Y., has issued Bulletin No. 1000E., a 40-page catalog giving descriptions, list prices and illustrations of condulets together with their applications.

New Jersey Foundry & Machine Company, 90 West Street, New York City, has issued Catalog 88, on overhead carrying devices, including electric hoists, cranes and trolleys, and other devices.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued Leaflet 1412, on starting and speed-adjusting rheostats for direct-current motors, and Leaflet F-4352, on 10-inch, alternating-current, 60-cycle, 100 to 120-volt, stationary and oscillating type fans.

Electric Appliance Company, 701 West Jackson Boulevard, Chicago, Ill., gave its third annual picnic and field day at Ravinia Park August 16. The program was arranged for good-time purposes only and included numerous field events and guessing contests, for which prizes were awarded. A tug-of-war and a baseball game were the feature events.

Rome Wire Company, Rome, N. Y., manufacturer of bare and insulated wire has recently placed in operation a copper-rod rolling mill, which is one of the most modern mills of its kind in the country. The building is of steel construction, with tile roof, brick walls and steel window sash, and is absolutely fireproof. The rod rolls are driven by two electric motors, operated at 2,200 volts. So far as known, this is the first electrical application for driving copper rolling machinery in this country, although the electric drive has been used in steel mill practice. The company is in a position to roll all the smaller sizes of copper and bronze rods, and the mill capacity is sufficient to take care of the company's requirements with provision for taking on additional business from its customers. The addition of this rolling mill gives the company an output of copper and bronze rods, copper wire, magnet wire, rubber-covered wire, lamp cords and special cables. It is not generally known that the city of Rome has a large number of concerns manufacturing copper products and has truly become a copper center. The products for which Rome is becoming well known are copper rods, wire, sheets, tubing, wire cloth, automobile radiators and wash boilers, brass tubing sheets, wire and trimmings. All of the plants are of modern construction and many have, within the last few years, improved their facilities.

The Diamond Power Specialty Company, Detroit, Mich., predicts that insuluminum, the patented metal with heat-resisting qualities greatly superior to iron and steel, will undoubtedly play an important part in the industrial development of the future. So satisfactory and indispensible has its use proved to the manufacturers of soot blowers and pyrometers that a demand has been created among the manufacturers of boilers, superheaters, economizers, stokers, annealing ovens, condensers, etc., for permission to use the material in those parts of their products that are exposed to continuous high temperatures, and arrangements are now being made by the licensees, the Diamond Power Specialty Company, whereby they may be supplied with the metal. Seldom has anything as revolutionary as insuluminum been accorded such a complete acceptance on its merits. Since its adoption the sale of Diamond blowers have more than doubled in volume, and the company's estimate of sales for the year beginning August 1, 1916, contemplates a further notable increase to a production to equip 1,000,000 horse power of boilers annually. During the past year a large number of successful applications of Diamond insuluminum soot blowers have been made in the hottest portions of boilers. Blowers constructed of the new metal are now installed at the central-station plants of the Detroit-Edison, New York Edison, Commonwealth Edison, Columbus Railway & Light, and Toledo Railways & Light Companies.

General Electric Company Employees Show Patriotism.—Industrial patriotism is most significant when it shows a mutual spirit in employer and employee. A splendid example of this kind of patriotism may be found among the working forces of the main plant of the General Electric Company at Schenectady, N. Y. It is here that more than 20,000 employees of the greatest electrical manufacturing plant in the world have contributed freely from their pay envelopes to buy an American flag for nearly every workshop and office building on the company's property. More than forty flags, most of them large enough to make a carpet for the average sized living room, now fly from buildings all over the works. Innumerable smaller flags, purchased by individuals, are seen everywhere, in doors, windows, on walls, and even suspended

Flag-Raising Exercises by Employees at General Electric Company's Schenectady Works.

from giant machines and traveling cranes. The patriotic feeling of the employees was first aroused last June, when they took a conspicuous part in the preparedness parade. It was later encouraged by the departure of the local militia company with 200 or more G. E. employees, and the formation of a General Electric military company. The first American flags were bought by individuals. Then subscriptions were started. They met with ready response. Americanized foreigners and workmen of foreign extraction were quite as liberal in contributing as others of native descent. A spirit of keen rivalry started among the employees of scores of buildings and departments, and flag after flag was purchased and hoisted, each one a little larger than its predecessor. More than $2,000, it is estimated, has been spent in purchasing flags since the movement started. Forty-three flags now float from the company's workshops, many of them of unusual size and rare coloring. There are three flags which measure 24 by 40 feet, and one monster which is the largest in the works or in the city of Schenectady. Its dimensions are 40 by 60 feet. Its field of blue covers several windows, while the tips of its long red stripes brush windows several stories below. The unfurling of this flag, like the raising of many others at the works, was marked with the same reverence and ceremony attendant on such occasions at an army military post. The flag-raising ceremonies are conducted during the noon hour and usually marked by good speech making, singing, and often some novel and spectacular feature in connection with the unfurling. When the flag on building No. 7 was raised, scores of miniature American flags concealed in the folds of the larger one were released and fluttered down upon the crowd. American beauty roses were used in a similar manner at building No. 8. Women employees as well as the men have taken up the flag idea, and when the flag was raised from the wiring-supplies building (No. 77) a girls' glee club of employees sang patriotic airs to the accompaniment of the inspiring music of the General Electric band of fifty musicians. Officials of the plant, including Vice-President Emmons, manager of the Schenectady works, take a keen interest in the flag ceremonies and are almost invariably on hand. At such ceremonies it is an impressive sight to watch thousands of men and women in working clothes standing with hats off while the band plays the "Star Spangled Banner." The effect of these ceremonies on the men is striking. "Formerly at the noon band concerts there were a few who did not think to remove their hats when the national air was played," remarked Electrical Superintendent Rohrer, who is always present at flag raisings. "The men just didn't think of it. Now, just as soon as the band starts the 'Star Spangled Banner,' off comes every hat." The company decided early that it should express its patriotism in keeping with the 24-hour operation of its busy shops. That meant 24-hour patriotism. The idea was to fly a large American flag from the roof of the main office building and illuminate it at night. Illuminating engineers of the company devised a scheme of lighting. Four G. E. projectors fitted with large Mazda lamps were placed on the roof below the flagpole. The powerful rays from the reflector bring out every detail of the flag at night and it stands out in bold contrast to the darkness. Recently a larger flag was put up and the number of reflectors increased to fourteen. So successful has the electrified flag been that other branches of the company located in other cities have been considering the erection of electric flags.

View Along Main Avenue of General Electric Company's Schenectady Works, Showing 14 Employees' Flags, the Largest Being 40 by 60 Feet.

LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

ATTACHMENT PLUGS, Fuseless. — Harvey Hubbell, Incorporated, Bridgeport, Conn.

Separable attachment plugs, having porcelain or composition bases or caps; 660 watts, 250 volts; catalog Nos. 5929, 6815, 6915.

Listed July 14, 1916.

AUTO-STARTERS.—General Electric Company, Schenectady, N. Y.

Automatically controlled contactors and air-cooled compensators mounted as a unit on slate panel; separate switches are required to disconnect line wires. All types are used as a means whereby potential impressed upon alternating-current motor terminals may be made less than full line voltage during starting process. Capacity 200 horsepower or less, 600 volts or less. Type C.R.-2363.

Listed June 5, 1916.

CONDUIT BOXES. — Appleton Electric Company, 212 North Jefferson Street, Chicago, Ill.

Cast-iron or pressed-steel Unilets for use as outlet and junction boxes, types 0 to 4, 5-R, 5-L, 6 to 8, 9-R, 9-L, 10, 11, O-A to 4-A, 5AR, 5AL, 6A to 8A, 9AR, 9AL, 1E to 6E, 1F to 6F, 1H to 5H, 1N to 11N, 14, 15.

Also above types with steel or porcelain covers with or without bushings.

Listed July 7, 1916.

CONDUIT BOXES.—P. & B. Manufacturing Company, 189 Fifth Street, Milwaukee, Wis.

Pressed-steel conduit boxes. "P. & B." Catalog Nos. 300, 400, 400D, 500, 500P, 500S, 600, 600DP, 600D, 600P, 700, 700L, 705, 705L, 710, 715, 715L, 720, 720L. All covers for above boxes.

Listed June 8, 1916.

FIXTURE FITTINGS.—P. & B. Manufacturing Company, 189 Fifth Street, Milwaukee, Wis.

Malleable-iron studs for supporting electric fixtures in outlet boxes, ⅜ and ½-inch sizes, catalog Nos. 212-13.

Listed May 27, 1916.

HEATERS, Electric.—Paasche Air Brush Company, Clinton and Madison Streets, Chicago, Ill.

Electric heater for air brush or paint sprayer system. An inclosed heater element resting against coils of pipe line, all incased in metal container, to be connected to 660-watt lighting circuit. Not supplied with connecting cord. 2.4 amperes, 250 volts; 4 amperes, 125 volts.

Listed June 30, 1916.

OUTLET BUSHINGS. Service Entrance.—Appleton Electric Company, 212 North Jefferson Street, Chicago.

Porcelain fittings having separate openings for each wire, secured over end of rigid steel conduit threaded connection. For use at exposed end of conduit (but not under fixture canopies.) Types SEA and SEB.

Listed June 29, 1916.

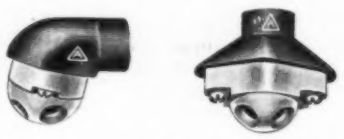
OUTLET BUSHINGS AND FITTINGS, Connectors.—P. & B. Manufacturing Company, 189 Fifth Street, Milwaukee, Wis.

Malleable-iron connectors for use with armored cable or flexible steel conduit. Straight and 90-degree types, for 0.5-inch electrical trade size.

Listed May 27, 1916.

PANELBOARDS. — Consolidated Electric Company, 223 North Thirteenth Street, Philadelphia, Pa.

Panelboards shown by tests and examinations to be in accordance with



Service-Entrance Outlet Bushings.—Appleton Electric Company.

requirements of the National Board of Fire Underwriters have labels attached.

Listed July 13, 1916.

RECEPTACLES, For Attachment Plugs.—Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins "Spartan." Flush type, 10 amperes, 250 volts, catalog No. 120. Also caps, KA, KB, KC, KD, MA. Spartan to Edison adapter, 660 watts, 250 volts, KF, NF.

Listed July 18, 1916.

RECEPTACLES, Standard. — General Electric Company, Schenectady, N. Y.

"G. E." brass shell. Keyless, 1,500 watts, 600 volts, catalog Nos. GE077-78, GE523-24, furnished with heat-resisting linings. The linings are made of specially treated asbestos, and are shown by Laboratories' tests to have good dielectric strength, to be reasonably uniform in dimensions, chemically neutral, less absorptive of moisture and less combustible than ordinary fiber, and to be little changed by exposure to temperature below 300 degrees Fahrenheit. Also above types with shadeholders attached.

Listed July 7, 1916.

RECTIFIERS FOR BATTERY CHARGING.—Stahl Rectifier Company, 536 South Clark Street, Chicago.

Mechanical rectifiers and panelboards consisting of synchronous motors, each driving a commutator which is designed to rectify alternating current at a reduced voltage obtained from an auto-transformer forming part of equipment. 4.5 kilovolt-amperes and less, 110 and 220 volts, 60 cycles.

Types A, AA, B, BA, C, CA, D, DA, for charging power batteries in garages housing gasoline-propelled vehicles.

Types E, EA, F, FA, G, GA, H, HA, for charging power batteries in garages housing electric vehicles.

Types M, N, for charging ignition batteries.

Listed June 27, 1916.

ROSETTES, Fuseless.—Adapti Manufacturing Company, 919 West Street, Cleveland, O.

3 amperes, 250 volts, catalog No. 3.

Listed July 10, 1916.

SIGN MACHINES.—A. & W. Electric Sign Company, Prospect Avenue and West Third Street, Cleveland, O.

Motor-operated sign-flasher machines of revolving drum and brush contact type; 6 amperes or less per switch, 250 volts or less.

Listed July 10, 1916.

SOCKETS, Standard.—Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins" metal shell. Key, 250 watts, 250 volts, catalog Nos. 4407, 7407; 600 watts, 250 volts, single-pole, quarter turn, catalog No. 4499. Pull, 250 watts, 250 volts, catalog No. 4408.

Listed July 7, 1916.

SOCKETS, Weatherproof.—Pass & Seymour, Incorporated, Solvay, N. Y.

Porcelain or composition shell. 660 watts, 600 volts, catalog No. 540 Shurlok. Also 486-87 metal shell, porcelain lined. 1,500 watts, 600 volts, catalog Nos. 523-25, 577, 589-95, 597 and double Shurlok, S-1250 to S-1253, S-1257, S-1263 to S-1265.

Listed July 7, 1916.

THEATER APPLIANCES.—American Reflector & Lighting Company, 517 West Jackson Boulevard, Chicago.

Border lights with movable colored gelatine slides over compartments, each inclosing a 300-watt, gas-filled lamp. "Major."

Listed June 16, 1916.

TRANSFORMERS. — Thordarson Electric Manufacturing Company, 501 South Jefferson Street, Chicago. Ill.

Bell-ringing transformers with primaries designed for connection to 110-volt alternating-current lighting or power circuits. Type B, supplying secondary voltages of 6, 14 and 20 volts. Three-way, supplying secondary voltages of 6, 8 and 14 volts.

Listed June 28, 1916.

PERSONAL AND BIOGRAPHICAL

MR. H. J. GEBHARDT, of the H. J. Gebhardt Company, 1419 Fisher Building, Chicago, Ill., who has been appointed district manager of the Chicago sales territory of the Electric Machinery Company, of Minneapolis,

H. J. Gebhardt.

Minn., has been identified with the machinery trades for 38 years, 16 of which he was in charge of Chicago sales work in connection with the Murray Iron Works, Burlington, Iowa, and the Fitchburg Steam Engine Company, Fitchburg, Mass. From 1878 to 1900, Mr. Gebhardt was employed in the capacity of foreman in several large machine shops in Minneapolis, and during part of that time was in business for himself in the machinery line. In 1900 he formed the H. J. Gebhardt Company in Chicago, and took over the sales work in the Chicago district for Murray steam engines and boilers and Fitchburg steam engines. He is also Chicago representative for Cookson IXL feed-water heaters, purifiers and receivers, Cox-Fulton stokers, Page-Burton water-tube boilers, and Roth Brothers & Company direct-current motors and generators. With the addition of the Electric Machinery Company apparatus, the H. J. Gebhardt Company is in a position to equip and install complete lighting and power plants from the products of the manufacturers the company now represents.

MR. BRYANT WHITE, formerly with the Southern Indiana Power Company, has entered the power sales division of the Public Service Electric Company, at Elizabeth, N. J.

MR. THOMAS G. HENDERSON, salesman for the North Adams Gas Light Company, which supplies electricity in Western Massachusetts, was featured in a recent issue of *Service Talks*, the Gas and Electric Improvement Company's house organ. Mr. Henderson's ability is evidenced by his standing at the head of a list of 15 salesmen of subsidiary companies month after month. He is a native of Southbridge, Mass.

MR. C. E. SPAULDING has resigned his position as sales manager of the Rubes Electric Devices Company, Brooklyn, N. Y.

MR. C. R. MARTIN, for some years employed in the power department of the New York Edison Company, is now doing similar work for the Public Service Electric Company, Elizabeth, N. J.

MR. MARVIN W. FOSS, of Leominster, Mass., has been appointed manager of the Berlin (N. H.) Electric Light & Power Company, which supplies Berlin and surrounding territory with power and light, and which is controlled by the Tri-State Electric Light & Power Company. Mr. Foss has been in the employ of the Leominster Electric Light & Power Company for a number of years. He is 25 years of age, and is one of the youngest central-station managers in New England.

MR. ERNEST VAN ARSDEL, manager of the Kentucky Utilities Company, at Shelbyville, Ky., has been elected vice-president of the corporation and put in charge of the company's properties in Central Kentucky, including the plants between Elizabethtown and Somerset. Mr. Van Arsdel will continue his residence in Shelbyville and his management of the property here and branches at Pleasureville, Eminence and New Castle.

MR. J. W. PERRY, who was re-elected chairman of the Exhibition Committee of the National Electric Light Association at its meeting on July 28, has been a conspicuous figure in the electrical industry for a number of years. He is vice-president of the H. W. Johns-Manville Company and for the past several years has been prominently identified with

J. W. Perry.

the exhibitions maintained by electrical manufacturers at the annual conventions of the N. E. L. A. The action of the committee in returning a cash dividend to exhibitors at the recent Chicago convention is a tribute to Mr. Perry who worked untiringly to make the exhibition the success it was.

MR. J. R. WATSON has become associated with the H. J. Gebhardt Company, of Chicago, Ill., which has recently been made the district sales agent for the Electric Machinery Company, of Minneapolis, Minn. Mr. Watson was graduated from

J. R. Watson.

the University of Michigan in 1906, receiving the degree of bachelor of science in electrical engineering. Following his graduation he became connected with the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., and took a two-year apprentice course in the shops and testing laboratories. Following this, he entered the erection department of the same company and among the large installations he was closely identified with was the electrification work on the New York, New Haven & Hartford Railroad. About six years ago he entered the Chicago office of the Westinghouse company and since that time has covered territory in Indiana, Illinois and Michigan on railway and lighting sales. His connection with the Gebhardt company was assumed last week, and he will have charge of the electrical work done by that concern.

OBITUARY.

MR. F. H. SMITH, at one time secretary and treasurer of the Weston Electrical Instrument Company, of Newark, N. J., died August 3 at his home in that city at the age of 81 years. Mr. Smith was also identified with the United States Electric Light Company, of New York City, at one time.

MR. PHILIP H. CLARKE, manager of the Union Light & Power Company, Franklin, Mass., was killed August 10 at Bellingham, Mass., when an automobile in which he was riding collided with a train at a grade crossing of the New Haven railroad. MR. ERNEST L. BROWN, of the General Electric Company, who was with Mr. Clarke in the automobile, was severely but not fatally injured, suffering a broken leg and bruises. Mr. Clarke was transferred last September to Franklin from Uxbridge, Mass., where he had been employed by a company allied with the Union Company.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

BELFAST, ME.—The Central Maine Power Company, of Augusta, which operates the local electric plant, has constructed a pole line between this city and Brooks, Me.

TURNER, ME.—Improvements in the plant of the Turner Light & Power Company are soon to be made. It is reported that J. A. Greenleaf & Sons, Auburn, Me., have the contract.

NASHUA, N. H.—A new electric-lighting contract has been awarded to the Nashua Light, Heat & Power Company. The installation of a number of nitrogen-filled units will be made.

PORTSMOUTH, N. H.—The Rockingham County Light & Power Company and the Kittery (Me.) Electric Light Company have jointly petitioned the Maine Public Utilities Commission for authority to execute a lease of the properties of the Kittery Company to the Rockingham Company. The former is a Maine corporation and the latter is organized and operates in New Hampshire. A hearing is set for August 21, at Kittery.

NEW BEDFORD, MASS.—The New Bedford Gas & Edison Light Company is planning to issue 3,180 shares of stock at par value of $100. The proceeds of the issue will be used for improvements in the power house and for extensions of the company's distribution system.

NORTHAMPTON, MASS.—The Northampton Electric Lighting Company has awarded a contract to the J. G. White Engineering Corporation, of New York City, for the engineering and construction work involved in the installation of a substation in this city, of 5,000-kilovolt-ampere capacity, 13,000 volts to 2,300 volts alternating current, and the erection of a double-circuit heavy copper transmission line between Northampton and East Hampton.

PLYMOUTH, MASS.—Construction of the Plymouth & Sandwich Street Railway is rapidly going forward. The line follows the shores of Massachusetts Bay and is expected to do a large summer resort business.

QUINCY, MASS.—The Bay State Street Railway Company, Boston, Mass., is planning a large extension to its generating station at Quincy Point, which will make the station twice its present size. It is reported that five turbines will be installed of the same capacity as those now operated. The brick addition to the building is estimated to cost about $70,000.

NEW BRITAIN, CONN.—The Aerial Cable Company, of this city, has been authorized by the Public Utilities Commission of Connecticut to construct an aerial cable for the transmission of electricity in New Britain and Berlin. The company is directed to install additional protection over the cable and messenger, at the poles, as a further protection to employees.

SOUTH NORWALK, CONN.—Arrangements have been made by the Electrical Commissioners for supply of energy from the Connecticut Company and the United Electric Light & Water Company during the enlargement of the municipal generating station. The J. G. White Engineering Corporation is making the improvements.

DUNKIRK, N. Y.—At a special election held for the purpose of voting on the proposed restrictive franchise to the Niagara & Erie Power Company, the voters approved the granting of a franchise. It is estimated that the company will spend $250,000 to provide facilities for furnishing electrical energy for power to factories in this vicinity.

GENEVA, N. Y.—The Public Service Commission has granted approval of the merger of the Central New York Gas & Electric Company with the Empire Gas & Electric Company. These corporations operate in this city and vicinity.

HAMMOND, N. Y.—The Public Service Commission is considering a petition of the Hammond Light & Power Company for permission to construct and operate an electric-lighting plant here and to exercise a franchise granted by the village.

ITHACA, N. Y.—The Public Service Commission has approved the franchise granted the Ithaca Gas & Electric Corporation for extensions of its gas and electric lines in Ithaca and Lansing.

WATERTOWN, N. Y.—The electric-lighting plant of the St. Lawrence International Electric Railroad & Land Company was purchased at a mortgage foreclosure sale by F. A. Rogers, vice-president and general manager of the Northern New York Utilities Company for that company. The purchase price was $40,000. The Northern New York Company will take over the lighting business and extend the service among the Thousand Islands. The Utilities Company has a high power transmission line from Clayton to Alexandria Bay and will furnish the electricity for power and lighting purposes from here, discontinuing the use of the steam plant at Alexandria Bay, which the company has used in the past to generate its electricity.

BUTLER, N. J.—The Common Council has passed an ordinance providing for the raising of $10,000 to be used for betterments to the municipal electrical-lighting plant. Of this amount $5,000 will be expended for extensions of the distribution system.

ORANGE, N. J.—The Public Service Electric Company will make alterations and improvements in its power station on Lakeside Avenue.

POMPTON PLAINS, N. J.—A number of business men here are planning to organize an electric-light company and to erect a plant for furnishing energy for light and power in this and other towns in Pequannock Township.

VINELAND, N. J.—Bids for the proposed improvements to the borough power plant were opened last week. The lowest bid exceeded the estimated cost by $10,000. The following bids were received: Lewis Wanner, Jr., Philadelphia, $112,957; J. F. Buchanan Supply Company, Philadelphia, $108,950; Louis & Roth Company, Philadelphia, $101,646; Thompson Brothers, Philadelphia, $98,000; Watson Flagg Engineering Company, New York, $94,000; M. L. Bayard & Company, Philadelphia, $93,000.

BEAVER FALLS, PA.—The Steffen Electric Company, to operate in White Township, Beaver County, with offices at Beaver Falls, has been incorporated with a capital of $5,000. J. E. White is one of the incorporators.

BEAVER FALLS, PA.—Business men here are planning rearrangements of the lighting system in the downtown district. The contract with the Beaver County Light Company expires August 31.

CHESTER, PA.—The United Telegraph Company is planning for the installation of a conduit system on Edgmont Avenue.

ORRTANNA, PA.—Application for charters have been made for the Fairfield Light & Power Company and the Franklin Township Light & Power Company, the two companies to furnish power to different communities in the western part of Adams County. The power plant of the two companies is operated in connection with the Musselman Canning Company's establishment here.

ROANOKE, VA.—The Norfolk & Western Railway Company proposes to extend its electric operation of trains from Vivian, W. Va., westward 10 miles, and also from Welch up the Tug Forks branch for five miles. The new construction necessary will begin in the near future. J. E. Crawford, Roanoke, Va., is chief engineer.

ROCKHILL, S. C.—Hamilton Carhart, 437 Michigan Avenue, Detroit, Mich., will erect a three-story mill at Carhart station on the Southern Railway, five miles from this city. An electric light and power system will be installed.

ELBERTON, GA.—The city will install a generating unit at the pumping station at a cost of about $1,200.

MANATEE, FLA.—The City Council has signed the contract presented by the Manatee Electric Company for furnishing energy for street lighting during the next three years.

PLANT CITY, FLA.—A city ordinance has been passed granting to Roscoe Nettles and associates, of Tampa, electric-light and gas franchises in this city.

VERO, FLA.—The Board of Trade is investigating the cost of proposed water, electric-lighting and ice plants. B. T. Redstone, W. L. Kemper and others are on the committee.

NORTH CENTRAL STATES.

BOWLING GREEN, O.—The power plant of the Lake Erie, Bowling Green & Napoleon Railway Light & Power Company in this city has been sold to Theodore Luce of Detroit, Mich., who represented the bondholders' committee. The purchase price was $140,000.

CLEVELAND, O.—Lighting Commissioner W. E. Davis has made a recommendation to Public Utilities Director T. S. Farrell for the use of the Kirtland water-pumping station as an extension of the municipal lighting plant. The station has a boiler capacity of 4,000 horsepower and its use would enable the lighting department to make arrangements for the enlargement of the municipal plant. Commissioner Davis approved an ordinance pending in the City Council authorizing a vote in November on the issuance of $1,750,000 in bonds for the extension of the plant. The approval is conditional on the taking over of the Cleveland Railway power contract.

COLUMBUS, O.—The City Council has approved plans for a new power plant for the Columbus Railway, Power & Light Company to be erected on Kimball Street. The plant is estimated to cost $300,000, and S. G. McMeen, general manager of the company, has announced that construction work will begin at once.

CUYAHOGA FALLS, O.—The Northern Ohio Traction & Light Company is to erect a new building at the west end of Glens Bridge, to be used by the Electric Package Company.

FRANKLIN, O.—A contract for furnishing energy for street lighting was awarded to the Ohio Gas & Electric Company, of Middletown.

MANSFIELD, O.—Ground has been broken for the new structure for the Mansfield Railway, Light & Power Company, operated by Henry L. Doherty & Company. The building will front on the Pennsylvania Railroad system. A generating capacity of 7,000 kilowatts will be installed at first, and transmission lines will be erected to Mansfield and Ashland.

MEDINA, O.—The City Council has made a contract with the Ohio Gas & Electric Company to furnish electric service here. The present plant will be dismantled or sold.

QUINCY, O.—E. Hensinger, of Piqua, was awarded the contract for the installation of a street-lighting system here.

DANA, IND.—The City Council has decided to dispose of the municipal electric-lighting plant to the Clinton (Ind.) Electric Light & Power Company. The latter Company will build a transmission line connecting the two cities and furnish electrical energy for light and power from its plant in Clinton.

GOSHEN, IND.—The Hawks Electric Company has prepared plans for an addition to its building on South Main Street, to cost about $3,000.

HARTFORD CITY, IND.—At a meeting of the City Council plans and specifications for the installation of 72 new cluster lighting units were adopted. Bids will be received this week.

MUNCIE, IND.—The Council has passed an ordinance authorizing bids to be advertised for the purchase of the municipal electric-lighting plant. In a contract submitted by the Muncie Electric Light Com-

pany an offer of $15,000 was made for the local distribution system, and it presumed the company will submit such an offer when bids are opened September 11.

RICHMOND, IND.—The City Council has appropriated $2,000 for miscellaneous expenses for the municipal electric-lighting plant and $7,000 for the construction of a water intake from the river to the plant.

ALBANY, ILL.—The contract for the installation of an electric-lighting system here was awarded to King Slocum, of Clinton, Iowa, on a bid of $3,992.

EFFINGHAM, ILL.—The Eastern Illinois Utilities Company will make an increase in its capital stock of from $105,000 to $160,000. Improvements are contemplated.

RANTOUL, ILL.—Ways and means are being considered to secure an electric-lighting system here.

DETROIT, MICH.—The Schlieder Manufacturing Company is awarding contracts for the construction of a power house to be erected at Oakland Avenue and East Grand Boulevard.

HAMBURG, MICH.—L. M. McCleary, of Gregory, Mich., is contemplating the installation of an electric-lighting system, the power to be furnished from a water-power site near here.

HANCOCK, MICH.—The City Council has decided to place the proposition of issuing bonds for the construction of a municipal electric-lighting plant before the voters at the November election. N. B. Beattie has been retained to prepare preliminary plans for the plant, estimated to cost between $60,000 and $175,000.

READSTOWN, WIS.—The Viola (Wis.) Electric Company has submitted a proposition to furnish electrical energy for light and power to this city.

NORTHFIELD, MINN.—The City Council and property owners on Division Street are planning an installation of an ornamental lighting system.

ST. PAUL, MINN.—The Prudential Light & Power Company, capitalized at $50,000, has been incorporated by Edward Feldhauser and others. The company owns and will acquire water-power sites on the Mississippi River and will sell energy to manufacturing concerns, specializing in service to the factories in the St. Paul Midway district. The offices of the new company are at 407 Germania Life Building.

BATAVIA, IOWA.—The Batavia Light & Power Company and the Birmingham Light & Power Company have been incorporated, each with a capital of $20,000, to furnish electric service in this city and Birmingham. Ralph Terrence is president of the two companies.

DAYTON, IOWA.—Bids will be received by the Town Council until August 21 for furnishing material and construction of an electric distribution system and a high-tension transmission line from Harcourt to Dayton. Specifications and material lists are being furnished by O. S. Larson, Town Clerk.

EXCELSIOR SPRINGS, MO.—The Excelsior Springs Water, Gas & Electric Company will soon install a 575-kilowatt General Electric generator direct-connected to a Hamilton-Corliss engine. This firm has recently built transmission lines to small towns in the surrounding territory and the new equipment was taken on to help take care of the additional load. Cowgill, Mo., is the latest town to be connected with Excelsior Springs by a new transmission line.

PORTAGEVILLE, MO.—Th Portageville Light & Power Company has been incorporated with a capital of $10,000 by A. L. Drerup and others to furnish electric service here.

RAVENWOOD, MO. — The Maryville Electric Light & Power Company has been granted a franchise to furnish electrical energy for light and power here. The company will construct a transmission line from Marysville to this city. Service may be also given to the towns of Parnell and Guilford.

ST. JOSEPH, MO.—The St. Joseph Railway, Light, Heat & Power Company will install a 5,000-kilowatt turbine before winter. The turbine will be obtained through the General Electric Company.

TROY, MO.—At a special election the voters here decided in favor of the proposition to sell the municipal electric-lighting plant and obtain service from the Southern Illinois Light & Power Company.

AUGUSTA, KANS.—An election will be held September 2 to vote on the issuance of $10,000 in bonds for water-works extensions and $10,000 for an electric-lighting plant.

DATES AHEAD.

International Association of Municipal Electricians. Annual convention, Baltimore, Md., August 22-25. Secretary, C. R. George, Houston, Tex.

Association of Edison Illuminating Companies. Annual convention, Hot Springs, Va., September 4-7. Secretary, G. C. Holberton, San Francisco, Cal.

Pennsylvania Electric Association, Annual convention, Eagles Mere, Pa., September 5-8. Secretary, H. M. Stine, 211 Locust Street, Harrisburg, Pa.

American Institute of Electrical Engineers. Pacific Coast convention, Seattle, Wash., September 5-8. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York City.

Northwest Electric Light and Power Association. Annual convention, Hotel Washington, Seattle, Wash., September 6-9. Secretary, W. G. Letson, Jim Creek Water, Light & Power Company, Arlington, Wash.

Indiana Electric Light Association. Annual convention, Anthony Hotel, Fort Wayne, Ind., September 12-14. Secretary, Thomas Donohue, Lafayette, Ind.

Illuminating Engineering Society. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., September 18-20. Assistant secretary, C. D. Fawcett, 29 West Thirty-ninth Street, New York City.

Association of Iron and Steel Electrical Engineers. Annual convention, Chicago, Ill., September 18-22. Secretary, W. O. Oschmann, Oliver Steel & Foundry Company, Pittsburgh, Pa.

American Electrochemical Society. Semi-annual meeting, New York City, September 28-30. Secretary, J. W. Richards, South Bethlehem, Pa.

Electrical Supply Jobbers Association. Quarterly meeting, Hotel Statler, Cleveland, O., October 10-12. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

New England Section, N. E. L. A. Annual convention, Pittsfield, Mass., October 17-20. Secretary, O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Jovian Order. Annual convention. Indianapolis, Ind., October 18-20. Secretary, Ell C. Bennett, Syndicate Trust Building, St. Louis, Mo.

Telephone Pioneers of America. Annual meeting, Atlanta, Ga., October 19-20. Secretary, R. H. Starrett, 15 Dey Street, New York City.

OMAHA, NEB.—Improvements now under way for the Omaha Electric Light & Power Company at Fourth and Leavenworth Streets will cost more than $1,000,000, according to a statement made by I. B. Zimman, one of the officials of the company. The improvements will include two new buildings, the installation of a 20,000-horsepower turbogenerator, an intake tunnel to the river and other construction work. It is expected that the entire installation will be completed by the first of the year.

JAMESTOWN, N. D.—According to an announcement made by John Canham, manager of the Western Electric Company, of this city, contracts have been let for the construction of a new power plant for the company. The power house will be 76 by 146 feet and the capacity of the station will be 1,400 horsepower. The new plant and machinery will cost about $65,000.

MILNOR, N. D.—An additional engine, generating unit and switchboard will be installed in the local electric-lighting plant at a cost of about $2,000.

STREETER, N. D.—An installation of the local electric-lighting plant has been completed and a number of business houses and private residences are being wired for electric service.

SOUTH CENTRAL STATES.

HAZARD, KY.—The Kentucky River Power Company, which is completing a large power plant in this city, has opened a downtown office in the Pursiful & Combs Building, with a complete stock of electrical appliances.

JASPER, ALA.—The Alabama Power Company is closing negotiations for the purchase of the property of the Jasper Water, Light & Power Company.

TCHULA, MISS.—Voters here have approved an issue of $4,600 in bonds, the proceeds to be used for the establishment of an electric-lighting plant.

GURDON, ARK.—The Gurdon Electric Company, organized by F. L. Stut, R. Swartz and G. P. Whittington, will establish electric-lighting and ice plants here.

HARRISON, ARK.—J. R. Boyd, of the Rogers (Ark.) Light & Water Company, is superintending the installation of the company's new power plant in this city.

NASHVILLE, ARK.—City officials are considering a plan to purchase the local electric-lighting plant owned by W. J. Risinger.

STUTTGART, ARK.—The property of the Stuttgart Water, Electric Light & Power Company has been sold to the Arkansas Light & Power Company for a reported consideration of $60,000. The latter company operates plants in about 15 cities in this state and plans to rebuild the local plant.

NEW ORLEANS, LA.—The Department of Commerce, Washington, D. C., has appropriated $50,000 for improvements to the harbor electric-lighting system here.

DALLAS, TEX.—The City Commission plans to extend the municipal lighting system to the Sunset Hill suburb.

DALLAS, TEX.—The City Commission has extended the time until December 1 in which the Dallas Consolidated Street Railroad Company shall begin the construction of the new tracks on Texas Street and Colorado Avenue.

MARLIN, TEX.—A contract with S. D. Hanna as chief engineer was signed by the directors of the Marlin-Temple Interurban Company and it was stated that work on final surveys, elevations, profiles and securing right of way would proceed at once. Citizens from Temple and Durango have pledged co-operation.

MIAMI, TEX.—City officials have completed arrangements for the installation of an electric-lighting and water plant here. Construction work will begin at once.

O'DONNELL, TEX.—S. T. Singleton will install a complete electric light and power plant at his ranch headquarters near here.

TERRELL, TEX.—The Terrell Electric Light Company announces that it will connect with the high-tension line of the Texas Power & Light Company and will in the future supply the city from this source. A line is being constructed from Jenkins via Mesquite and Forney for this purpose.

WESTERN STATES.

GREAT FALLS, MONT.—The Montana Power Company, according to Frank W. Kerr, general manager, will begin work immediately upon enlargement of the hydro-electric plant at Rainbow Falls, near here. The company's plant will be enlarged by an additional 13,000 horsepower, and the work contemplated will involve an expenditure of more than $500,000. A portion of the waterwheels and other machinery has been ordered. Superintendent of Construction Frank Scotten will have charge of the work.

HINSDALE, MONT.—Plans and specifications have been prepared for a municipal water and electric-lighting plant and approved by the Commissioners.

OATMAN, ARIZ.—The Oatman Water & Sewer Company plans to pipe water to Oatman from the Colorado River, a distance of 11 miles, and to pump it into a large storage reservoir which it will build here for the purpose of supplying the town and adjacent mines with water. The same company will construct electric-lighting and sewer systems. More than $500,000 will be expended in the public utility projects. V. S. Rowley is at the head of the company.

WINNEMUCCA, NEV.—Edson F. Adams, president; B. Brown, vice-president, and Joseph Bean, general manager, of the Nevada Valleys Power Company are here this week completing preliminaries for the extension of the company electric transmission line from Rochester through Winnemucca to Battle Mountain.

BOISE, IDAHO.—The properties and holdings of the Electric Investment Company have been taken over by the Idaho Power Company, recently organized for that purpose. The new concern has a capital stock of $17,000,000. The officers and directors of the new company will be identical with that of the old concern, and the board of directors will be composed of 12 stockholders from Idaho and four from New York City. The company supplies light and power to 54 cities and towns in the vicinity of Boise and contracts for power at Barber Dam and U. S. Reclamation Service. The Boise Valley Traction

Company is a subsidiary of the corporation.

BUHL, IDAHO.—The contract for the new 600-candlepower city lamps to replace the ones now in use has been awarded by the City Council. Nitrogen-filled lights will replace the present arc lights.

COVE, IDAHO.—Construction work on the new hydroelectric power house of the Utah Power & Light Company, near this city, is being rapidly pushed, and it is stated the plant will be ready for operation early next spring. This plant is a part of the company's general plan to develop the natural resources of the Bear River country.

HOQUIAM, WASH.—The City Council is favoring a proposition to acquire the pole and power lines of the Grays Harbor Railway & Light Company, and install a municipal electric-lighting plant to supply the city. It is reported a special election to vote on the question will be held in the near future.

ILWACO, WASH.—It is understood that a short-period electric service may be installed in this city by the North Shore Light & Power Company. The company has been petitioned to install the service, to permit the use of electrical equipment.

SPOKANE, WASH.—Contract for curb lighting on Main Avenue has been awarded by City Commissioners to the Washington Water Power Company on its bid for $49,-920. This was the only bid submitted.

SPOKANE, WASH.—In an effort to secure lower rates, the City Council is issuing a call for bids for furnishing energy for the city hall and new comfort station on Howard Street, under construction, bids to be received until September 4 by Commissioner Broom. It is pointed out that the new rates charged in Spokane are 2.25 cents per kilowatt-hour on a flat basis, while the city pays in excess of three cents, buying its current from the Washington Water Power Company. New offers will be made on five-year contract.

BEND, ORE.—Within two weeks the local light plant of the Bend Water, Light & Power Company will be greatly enlarged by the installation of machinery and equipment now on the ground. In the future water will be delivered directly to the turbines from the pond instead of the flumes as heretofore.

MARSHFIELD, ORE.—The Navy Department has awarded the contract for the construction of a wireless telegraph station at Eaglewood to W. W. Ladd, of Marshfield. Operators' quarters, a power house, oil shed, coal shed and two wireless towers are to be erected at a cost of about $20,000.

SALEM, ORE.—The Oregon Corporation Commissioner has granted a permit to the Idaho Power Company, organized under the laws of Maine, to transact business in Oregon. John A. Laing, of Portland, Ore., will be the company's official representative in Oregon.

SEASIDE, ORE.—The telephone lines and equipment of the Pacific Power & Light Company in this city have been purchased by the Pacific Telephone & Telegraph Company. The line connects Gearhart and Cannon Beach with Seaside. A number of improvements are being planned to increase the service.

HAYWARD, CAL.—Plans are under way here for the replacing of the present overhead lighting system with a new system of electroliers.

LOS ANGELES, CAL.—The Board of Public Service Commissioners of this city is advertising for bids for furnishing transformers to the city as per schedule.

LOS ANGELES, CAL.—Plans are now being prepared for the addition of three stories to the building of the Southern California Edison Company on Fourth Street, near Main.

OROVILLE, CAL.—The Pacific Gas & Electric Company, of San Francisco, has brought suit in this county to condemn land needed for the erection of a dam for hydroelectric power purposes.

SAN RAFAEL, CAL.—The Board of Supervisors of this county have advertised for bids for the installation of and care for 20 lights in the Laverne lighting district of this county.

TAYLORVILE, CAL.—The California Railroad Commission has laid over for 90 days the application of George M. Hall for permission to erect an electric light and power plant and transmission system in Taylorville. The Plumas Light & Power Company has protested against the granting of Mr. Hall's application.

Proposals

ELECTRIC-LIGHTING PLANT.—Bids will be received until August 22 by D. A. Bohlen & Sons, architects, 1002 Majestic Building, Indianapolis, Ind., for an isolated electric-lighting plant at the country home of H. F. Campbell, of the Stutz Motor Company.

ELECTRICAL CONSTRUCTION.—Sealed bids will be received at the office of the Board of Trustees of the town of Dunreith, Ind., until September 1 for the purpose of furnishing supplies and labor for the construction of an electric-lighting and power system. Plans are on file at the office of the engineer, A. Sohlesinger, 212 Traction Terminal Building, Indianapolis, Ind. G. C. Rogers, Town Clerk.

CABLE.—Sealed proposals will be received at Room 406, City Hall, Chicago, Ill., until August 21, for furnishing and delivering to the Marshall Boulevard municipal plant, Thirty-first Street and Sacramento Avenue, 3,000 feet of No. 2 lead-covered cable according to plans and specifications on file in the office of the Department of Public Works. W. R. Moorhouse, Commissioner of Public Works.

New Incorporations

AKRON, O.—Loomis Electric Company. Capital $10,000. Incorporators: C. H. Loomis, F. F. Loomis, Jr., and others.

CLEVELAND, O.—Cleveland Electric Motor & Manufacturing Company has increased its capital stock from $10,000 to $45,000.

BOSTON, MASS.—Northern Kansas Electric Company. Capital $750,000. Incorporators: E. C. Potter, G. L. Parker and B. I. Cushing.

CHICAGO, ILL.—Electric Service Company of America. Capital $50,000. Incorporators: J. J. Falvey, G. C. Hyland and A. W. Brickwood.

ROCHESTER, N. Y.—Industrial Electric Company. Capital $15,000. Electrical contracting. Incorporators: H. W. Davison, E. F. Davison and T. T. Benz.

BUFFALO, N. Y.—Ho-Po Electric Company. Capital $3,000. Manufacture dynamos, etc., Incorporators: Charles W. Hoppie, F. C. Polland and F. A. James.

NEW YORK, N. Y.—Duzets & Son. Capital $50,000. Manufacture electrical apparatus. Incorporators: Joseph Duzets and F. A. Duzets, of 1019 Trinity Avenue, and L. J. Davidson, of 1125 Boston Road.

BROOKLYN, N. Y.—Cordland Electric Company. Capital $500,000. Manufacture dynamos, electrical goods, etc. Incorporators: Robert B. Lea, 55 Hanson Place; Elmer A. Sperry, and Frank R. Allen.

NEW YORK, N. Y.—Filament Supply Company. Capital $10,000. Manufacture carbon filaments. Incorporators: F. J. Rooney and J. J. Rooney, of Hoboken, N. J., and J. C. Jackson, of New York City.

NEW YORK, N. Y.—The Tesla Company. for lighting, heating, telephoning, telegraphing, wireless transmission and submarine signaling. Incorporators: N. Tesla and R. D. Buttrags, of 8 West Fortieth Street, and G. Scherff, of 17 Battery Place.

BLOOMFIELD, IND.—Indiana Power & Water Company. Capital $200,000. Holding company for the Utilities Development Corporation, of Chicago, Ill. Incorporators: A. C. Keene, A. R. Coker and C. E. Gregg, of Bloomfield, and L. S. Kositchek, of Chicago.

Financial Notes

General Electric Company has declared the regular quarterly dividend of two per cent, payable October 14 to stock of record September 16.

The Public Service Corporation of New Jersey is asking for tenders, through the Fidelity Trust Company of Newark, until August 21, for sufficient of its general mortgage five-per-cent sinking-fund 50-year bonds to exhaust $209,500 now available for the sinking fund.

The Pacific Lighting Company, of San Francisco, Cal., has declared an extra dividend of 50 cents per share on the common stock of the company in addition to the regular dividend of $2 per share on the common and $1.25 on the preferred stock for the quarter. This puts the company's 48,000 shares of common stock outstanding on a ten-per-cent dividend basis.

The Coast Counties Gas & Electric Company, which distributes electric energy and gas in Santa Cruz, Monterey, Santa Clara and San Benito Counties, immediately south of San Francisco, has applied for an extension of time for selling its first-preferred stock until December 31. The company was originally authorized to sell 1,000 shares at not less than 85 per cent of the par value by June 30. Eight hundred and fifty-two shares have already been sold at 90 per cent of the par value.

Pacific Gas & Electric Company has now acquired all but two of the first mortgage bonds of Oro Electric Corporation. These two bonds are held in Great Britain and cannot be located. The average cost of the Oro bonds to Pacific Gas & Electric is said to have been a fraction over 75. Substantially all the bonds were acquired at 75, but for a few bonds a higher price was paid to a holder who held out for the call price of the bonds. A report that Pacific Gas & Electric Company was also seeking control of Northern California Power Company and had taken an option at 30 on 20,000 shares of the 100,000 shares of the company is denied by officials of Pacific Gas & Electric Company.

The six-per-cent secured coupon gold notes of the Denver Gas & Electric Light Company have been called for redemption and interest will cease to accrue after October 1 next. The call price is 101. Provision for the retirement of the notes was made by the sale during recent months of first and refunding five-per-cent bonds of the company, due 1951, which formed part of the securing collateral. More than half of the $3,500,000 of notes have already been deposited with the trustee, and the remainder will be retired October 1, in accordance with the terms of the call. In addition to first and refunding 5s there are $936,000 Denver Gas & Electric Company general (now first) mortgage 5s, due 1949, included in the collateral. These bonds will not now be offered for sale, and will, therefore, in due course return to the treasury of the company.

Cities Service Company has made an offer to the holders of voting trust certificates representing the preferred and common stocks of the Toledo Traction & Power Company to take over their holdings. For each share of Toledo Traction, Light & Power Company preferred stock Cities Service Company offered to give one share of its own cumulative preferred stock, and for each share of Toledo common stock 35-100 shares of Cities Service preferred and 7-100 shares of common stock. The company announced that the privilege of making the exchanges would extend until September 1, the conversion to be made as of that date. The offer is contingent upon the assent of holders of a substantial ma-

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Aug. 14	Aug. 7
American Tel. & Tel. (New York)	130⅛	129½
Commonwealth Edison (Chicago)	142	142
Edison Electric Illuminating (Boston)	....	239
Electric Storage Battery common (Philadelphia)	67½	65¾
Electric Storage Battery preferred (Philadelphia)	67½	65¾
General Electric (New York)	170	167
Kings County Electric (New York)	....	....
Massachusetts Electric common (Boston)	7¼	8
Massachusetts Electric preferred (Boston)	41½	40
National Carbon common (Chicago)	178	170
National Carbon preferred (Chicago)	121¾	121¼
New England Telephone (Boston)	130	128
Philadelphia Electric (Philadelphia)	29	28¾
Postal Telegraph & Cables common (New York)	....	....
Postal Telegraph & Cables preferred (New York)	....	....
Western Union (New York)	94	93¼
Westinghouse common (New York)	58¼	57
Westinghouse preferred (New York)	68	68

jority of both classes of stock, and the company reserves the right to withdraw the offer unless the holders of at least 75 per cent of each class assent to the exchange.

Reports of Earnings.

BYLLESBY COMPANIES.

Combined earnings of all properties under management of H. M. Billesby & Company for June and the 12 months ended June 30, were as follows:

	1916	1915
June gross	$1,261,285	$1,142,531
Net after taxes	605,977	533,366
Twelve months' gross	16,295,551	15,016,963
Net after taxes	8,026,693	7,226,832

For June, 1916, the gain in gross was 10.41 per cent and in net 13.6 per cent over June, 1915 while for the 12 months there were increases of 8.5 per cent in gross and of 11 per cent in net over the preceding 12 months.

COMMONWEALTH POWER, RAILWAY & LIGHT COMPANY.

Commonwealth Power, Railway & Light Company reported as follows for the year ended June 30, 1916:

	1916.	1915.
Earnings from stocks	$2,776,500	$2,382,175
Interest and other earnings	580,811	603,367
Total income	3,357,311	2,985,542
Expenses and taxes	149,948	140,584
Amortization of debt discounts	28,932	28,932
Interest charges	630,183	640,350
Net income	2,548,248	2,175,676
Preferred dividends	971,075	960,000
Surplus	1,577,173	1,215,676

BELL TELEPHONE SYSTEM IN THE UNITED STATES.

June—	1916.	1915.
Total operating revenues	$ 22,000,263	$ 19,707,239
Operating expenses	14,588,909	13,078,365
Net operating revenues	7,411,354	6,628,874
Net after taxes	6,114,250	5,399,604
Six months—		
Total operating revenues	127,500,391	114,470,709
Operating expenses	83,733,126	75,859,040
Net operating revenues	43,767,265	38,611,669
Net after taxes	35,961,558	31,319,181
Miles wire owned	19,008,792	17,863,705
Bell stations owned	6,270,482	5,743,185
Bell connected stations	3,251,182	3,127,730
Total stations	9,521,664	8,870,915

Electrical Patents Issued August 8, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,193,508. **Trolley-Wire Apparatus.** G Buttrick, assignor to Ohio Brass Co., Mansfield, O. Supporting clamp.

1,193,514. **Binding Post.** W. A. Chryst, assignor to Dayton Engineering Laboratories Co., Dayton, O. Has two spring clamps insulated from each other. (See cut, next page.)

1,193,519 and 1,193,520. **Lightning Fixture.** D. Crownfield, Cambridge, Mass. First patent: Number of independently lighted lamps and shield screening lamps from each other. Second patent: Ceiling fixture has adjustable shade and inclosure for lamp with pull cord through bottom.

1,193,521. **Wire Hanger.** E. R. Cunningham, Portland, Ore. Catenary suspension for trolley wires.

1,193,525. **Disk Grinding Machine.** S. Dosch and C. R. Dosch, Stratford, Conn. Electric-motor-driven.

1,193,534. **Fountain-Pen Flashlight.** J. Friedman and J. L. Friedman, New York, N. Y. Has lamp near pen and battery in casing.

1,193,537. **Dynamo in Combination with Automatic Switch.** E. Girardeau, Paris, France. Charging unit.

1,193,539. **Signaling Device for Automobiles.** D. H. Gray, Fresno, Cal. Signal lamp and disk on extensible telescoping rods.

1,193,548. **Lighting System for Moving Vehicles.** G. Honold, assignor to Firm of Robert Bosch, Stuttgart, Germany. Lighting system having variable-speed generator and storage battery.

1,193,563. **Electric Sign.** E. R. Knowles, assignor to Mercantile Advertising Co., New York, N. Y. Arrangement of clamps and letter units.

1,193,579. **Fixture for Electric Incandescent Lamps.** R. A. Mahan, Jonesboro, Ark., assignor of one-half to W. J. Baker, Newport, Ky. Portable support.

1,193,602. **Insulator-Supporting Fixture.** C. L. Pierce, Jr., assignor of one-half to Hubbard & Co., both of Pittsburgh, Pa. Bracket for pin-type insulators.

1,193,606. **Snap Switch.** C. D. Platt, Bridgeport, Conn. Two-push-button, flush switch.

1,193,607. **Elevating Cuspidor.** B. J. Post, San Francisco, Cal. Electrically driven and controlled.

1,193,621. **Apparatus for Indicating and Locating Defects in the Ignition, Valve and Carburetor Systems of Internal-Combustion Engines.** E. H. Scott, Malvern near Melbourne, Victoria, Australia. Arrangement of switches and visible spark-gaps.

1,193,622. **Circuit-Breaker.** W. M. Scott, Tredyffrin Township, Chester Co., Pa. Toggle-operated, laminated-brush, carbon-break switch.

1,193,631. **Metal-Punching Machinery.** G. P. Thomas, Glenshaw, Pa. Movement of carriage electromagnetically controlled.

1,193,633. **Electric Fuming or Distilling Furnace and Condenser Therefor.** J. Thomson, assignor to J. Thomson Press Co., Jersey City, N. J. Has special form of zig-zag plate resistor.

1,193,635. **Automatic Train-Controlling System.** G. P. Thurber, Pittsburgh, Pa. Air breakes electromagnetically controlled through track current.

1,193,641. **Electrical Rectifier.** C. M. Wall, Toledo, O. Special arrangement of reed vibrator.

1,193,646. **Fuse-Receptacle Lock.** G. Wesley, St. Paul, Minn. Lock plate on cover prevents removal of plug.

1,193,656. **Burglar and Holdup Alarm.** G. E. Leager, Chicago, Ill. Mechanically controlled mechanism successively fires cartridges.

1,193,660. **Electric Switch.** T. E. Barmum, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Electromagnetically operated, has laminated brush and carbon break; largely of sheet metal.

1,193,678. **Electromagnet.** F. F. Fowle, Chicago, Ill. Special structure of relay.

1,193,682. **Machine for Wrapping Broaches and the Like.** L. L. Funk, Chicago, Ill. Electric-motor operated and controlled.

1,193,685. **Implement for Handling Incandescent Lamps.** Pole has clamp on end for gripping lamp bulb and mechanism for turning clamp.

1,193,694 and 1,193,695. **Electric Switch.** E. H. Jacobs, assignor to General Electric Co., Schenectady, N. Y. Special structure of container and operating mechanism for oil switches.

1,193,696. **Operating Mechanism for Electric Switches.** E. H. Jacobs, assignor to General Electric Co. Modification of above.

1,193,698. **Ignition Switch.** W. Kaisling, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Combination of light, ignition and starting switches for automobiles.

1,193,705. **Circuit-Closer.** W. G. Lynch, Roanoke Rapids, N. C. Gravity-operated, held open by fusible member.

1,193,724. **Lamp Support and Reflector.** O. R. Skelton, assignor to Studebaker Corp., South Bend, Ind. For headlights.

1,193,741. **Method of Preventing Disintegration of Anodes.** G. D. Van Arsdale, New York, N. Y. In the electrolysis of copper solutions.

1,193,764. **Dry Cell.** D. Conlau, Jr., Brooklyn, N. Y. Metallic container is one element and carries flexible connecting strip.

1,193,773. **Magnetic Detector Apparatus for Railways.** A. H. Fox, New York, and A. W. Lenderoth, Stapleton, N. Y. Switch on vehicle controlled by movement of magnet co-operating with track rail acting as armature.

1,193,778. **Receiving Apparatus for Radio-Transmission Systems.** A. H. Grebe, assignor to E. B. Miller, Richmond Hill, N. Y. Telephone receiver in receiving circuit speaks into microphone, the conductivity of which may be varied.

1,193,783. **Art of Reducing Metal Ores and Fusing Other Metals.** C. B. Hillhouse, New York, N. Y. Finely divided ore is passed axially through arc area at higher speed than that due to gravity.

1,193,786. **Electrolytic Apparatus for the Production of Liquor for Bleaching and Other Purposes.** A. Holliday, Wimbledon, London, England. Mounting and arrangement of container and electrodes.

1,193,793. **Electromagnet.** R. E. Jones and V. S. Monteith, Hagerstown, Md. Special structure of core and armature.

1,193,798. **Catalyzer Apparatus for Oxidizing Ammonia.** W. S. Landis, assignor to F. S. Washburn, Nashville, Tenn. Element has powdered catalyzer traversed by conductor for uniformly heating it.

1,193,799. **Platinum Catalyzer.** W. S. Landis, assignor to F. S. Washburn. Catalyzer element is wire or iridium-free platinum connected in electric circuit.

1,193,800. **Catalyzer for Oxidizing Ammonia.** W. S. Landis, assignor to F. S. Washburn. Above element is in the form of wire gauze.

1,193,807. **Electric Telegraph-Receiving Apparatus of the Selective Type.** W. J. Lyons, Dublin, Ireland. Impulse-operated.

1,193,821. **Automobile Signal.** H. B. Richards and R. Solomon, Alexandria, Va. Light on semaphore arm is flashed as arm is thrown to one side into horizontal position.

1,193,835. **Dispatcher's Telephone System.** C. A. Simpson, assignor to Kellogg Switchboard and Supply Co. A number of operators' substations are selectively called from dispatcher's station.

1,193,841. **Projecting Arc-Lamp.** A. D. Stanreford, Kansas City, Mo. Special carbon-holding mechanism.

1,193,848. **Lightning Arrester.** G. W. Van Horn, Tulsa, Okla. Grounded net work of conductors protecting oil tank.

1,193,866. **Consuming Electrode for Luminous-Arc Electric Lamps.** F. Buchanan, Syracuse, N. Y. Positive electrode metallic and larger than luminous negative which has oblong section with greater dimension parallel to focal axis.

1,193,873. **Refracting Cover Glass for Automobile Headlights.** W. Churchill, assignor to Corning Glass Works, Corning, N. Y. Has special arrangement of prismatic faces.

1,193,882. **Electric-Arc Furnace.** E. Edwin, assignor to Norsk Hydro-Electrisk Kvaelstofaktieselskab, Christiana, Norway. Interconnection of electrodes of plurality of furnaces and provision for passing gas through them.

1,193,890. **Trolley Catcher and Retriever.** C. E. Gierding, New Haven, Conn. Arrangement of dogs for effecting engagement between catcher and retriever.

1,193,894. **Electric Lamp.** W. A. Harvey, Scranton, Pa. Mounting of reflector, socket, etc., on arm for clamping to table, etc.

1,193,897. **Dynamoelectric Machinery.** R. A. Holbech, assignor to A. Rolfe, London, England. Arrangement of air passages with rotor acting as centrifugal fan.

1,193,917. **Motor-Control System.** H. N. Nye, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Operates by controlling shunt and series windings of supply generator.

1,193,926. **Electric Signaling Device.** R. R. Root, Cleveland, O. Horn has electromagnetically vibrated diaphragm.

1,193,942. **Lamp Dimmer.** W. J. Starkweather and F. C. Miller, Los Angeles, Cal. Dimming fluid is forced in and out of space in lens of headlight.

1,193,966. **Socket Shell.** L. W. Anderson, assignor to General Electric Co. Cap has threaded skirt engaging with collar turning on body.

1,193,979. **Galvanometer.** A. Blondel, Paris, France. Special structure having its support in an oil box.

1,193,989. **Electrode for Welding, Brazing, Soldering, or the Like.** C. L. Cadle, Rochester, N. Y. For connection to high tension; contains carborundum giving high resistance at the welding point.

1,193,998. **Projection Apparatus.** C. de Proszynski, London, England. Has incandescent lamp with shiftable filament so that deposit will be on different parts of bulb.

1,193,999. **Method of and Apparatus for Transforming Motion into Electrical Waves or Impulses.** T. B. Dixon, New York, N. Y. Current varied by subjecting radio-electrosensitive substance in circuit to specially manipulated rays of light.

1,194,000. **Method of Purifying Sewage and the Like.** D. T. Dobyns and J. K. Elderkin, Jr., Newark, N. J., assignors to Clark Process Corp. Material is electrolyzed with chemical producing germicide.

1,194,018. **Sounding Device for Decoys.** F. V. Hartner, Toledo, O. Electromag-

netically vibrated reed adjustable as to pitch.

1,194,066. System of Wireless Communication. J. A. Proctor, assignor to Wireless Specialty Apparatus Co., Boston, Mass. Method of preventing extra discharges.

1,194,071. Method of Exciting X-Ray Tubes. C. E. Rohrer, assignor to Scheidel-Western X-Ray Coil Co., Chicago, Ill. Has special interrupter arrangement in secondary circuit of transformer.

1,194,078. Time Switch for Electric Lights. W. T. Rowell, assignor to C. F. Wiedmaier, both of Chicago, Ill. Time mechanism controls pull switch.

1,194,079. Rat Trap. J. Schack, Chicago, Ill. Has platforms forming electric terminals.

1,194,084. Electrical Measuring Instrument. B. H. Smith, assignor to Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. Governing mechanism for recording meter.

1,194,090. Electrical Winding. C. P. Steinmetz, assignor to General Electric Co. Prevents building up of dangerously high voltages by resonance.

1,194,099. Electric-Railway Vehicle. K. Von Kando, assignor to Westinghouse Electric & Manufacturing Co. Mounting and gearing of motors.

1,194,103. Alternating-Current Motor. A. F. Welch, assignor to General Electric Co. Commutator brushes stationary up to certain speed when rotor winding is short-circuited and brushes released to turn with rotor.

1,194,116. Railway Signaling. H. D. Abernethy, Cleveland, O. System including polarized relays for operating signals at ends of section of track.

1,194,122. Connecting Plug. H. P. Ball, assignor to General Electric Co. Socket for connecting plug made of sheet-metal blank.

1,194,124. Method of Working Glass. C. J. Barrows, Los Angeles, Cal. Conducting stripe of high resistance painted on glass and severance effected by passing current.

1,194,125. Rheostat. H. F. Bethune, assignor to Westinghouse Electric & Mfg. Co. Ratchet and time-element mechanism for operating arm.

1,194,129. Wattmeter. W. M. Bradshaw and A. W. Copley, assignors to Westinghouse Electric & Mfg. Co. Alternating-current motor meter.

1,194,132. Time-Limit Relay. H. W. Brown, assignor to Westinghouse Electric & Mfg. Co. Electromagnet and dash-pot device.

1,194,133. Switchboard Apparatus. J. M. Broan, assignor to Westinghouse Electric & Mfg. Co. Chain and sprocket device for operating apparatus at a distance.

1,194,134. Switch. M. D. Brown, Waterloo, Iowa. For flash-lights.

1,194,137. Electric Plug. G. H. Buckley, Indianapolis, Ind. Has elongated conductor supporting portion.

1,194,138. Rotary Converter. J. L. Burnham, assignor to General Electric Co. Fed through windings on machine driven synchronously with and excited according to wattless current of converter.

1,194,140. Vacuum-Type Converter. L. W. Chubb, assignor to Westinghouse Electric & Mfg. Co. Shield surrounding arc path is positively charged.

1,194,142. System for Telegraphic and Telephonic Communications. J. H. Claus, West Philadelphia, Pa. Comprises two conductors extending from transmitting to receiving station with means for varying current for telephonic and interrupting for telegraph signals.

1,194,143. Starting Electrode for Vapor-Electric Devices. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Has a carbon bearing.

1,194,154. Apparatus for Producing Electrical Oscillations. M. Eastham, assignor to General Radio Co., Cambridge, Mass. Special relationship of oscillatory and impulse circuits for wireless transmission.

1,194,160. Cam Rectifier. C. L. G. Fortescue, assignor to Westinghouse Electric & Mfg. Co. Has cam-operated vibratory contact.

1,194,165. Energy-Supply System. W. H. Fry, assignor to General Electric Co. Constant demand on supply circuit secured by supplying a heat-storage device inversely as the load varies.

1,194,168. Luminous Radiator. A. J. Geiger, assignor to Westinghouse Electric & Mfg. Co. Bulb mounting, terminal box, etc., of incandescent-bulb electric heater.

1,194,178. Light Fixture. W. D. Herwig, Jr., Chicago, Ill. Water-shedding lamp suspension, shade support, etc., for outdoor lights.

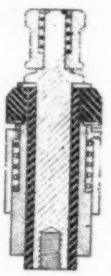
1,194,194. Electric Circuit-Controlling Device. W. L. Kubach and E. J. Edwards, assignors to General Electric Co. Overload circuit-breaker in casing similar to lamp bulb and adapted to be screwed into lamp socket.

1,194,195. Lightning Arrester. R. P. Jackson, assignor to Westinghouse Electric & Mfg. Co. Tubular device similar to cartridge fuse, has tubular condenser, non-inductive resistance and spark-gap.

1,194,196. Current-Rectifier. R. P. Jackson, assignor to Westinghouse Electric & Mfg. Co. Mercury-vapor device having magnetic blow-out adjacent each anode.

1,194,202 and 1,194,203. Electrical Measuring Instrument. P. MacGahan, assignor to Westinghouse Electric & Mfg. Co. First patent: recording instrument having actuating means supplemented through portion of its range by adjustable gravity device. Second patent: recording device comprising instrument of Kelvin balance type.

1,194,211. Electric Locomotive. B. S. Moore, assignor to Westinghouse Electric & Mfg. Co. Pair of motors have removable cores and means for securing them and a common truck center-pin.



No. 1,193,513.—Binding Post.

1,194,218. Attachment-Plug Fitting. A. H. Nero, assignor to Arrow Electric Co., Hartford, Conn. Shutter mechanism for face plate of flush receptacle. (See cut.)

1,194,225. Screen for Headlights. E. B. Phippen, Salt Lake City, Utah. Shield plate supports secured to glass face by vacuum cups.

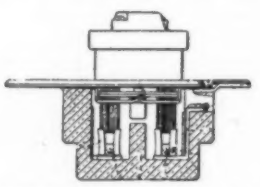
1,194,228. Protective Device. A. Purdon, assignor to Westinghouse Electric & Mfg. Co. For connecting and disconnecting two portions of transmission line normally held in tension.

1,194,232. Dynamoelectric Machine. C. S. Raymond, assignor to General Electric Co. Field-frame structure.

1,194,233. Coring Machine and the Like. A. L. Reiner, assignor to Libby, McNeil & Libby, Chicago, Ill. Electric-motor-driven.

1,194,243. Electric Switch. C. E. Schultze, Denver, Col. Cam and pump spring, push operated.

1,194,245. Marking Insulated Wire. T. J. Seward, assignor to Electric Cable Co., Bridgeport, Conn. Design is indented in insulation while soft.



No. 1,194,218.—Attachment-Plug Fitting.

1,194,265. Alternating-Current Motor. E. F. W. Alexanderson, assignor to General Electric Co. Circuit arrangements with relation to transformer of motor having commuted armature and inducing and exciting windings.

1,194,272. Electric Switch. R. H. Carl, Greenfield, Iowa. For electric signs.

1,194,274. Transmitter for Signaling by Electomagnetic Waves. F. J. Chambers, assignor to Automatic Telephone Mfg. Co., Liverpool, England. Details of rotary-disk transmitter.

1,194,280. Telephone. P. B. Delany, South Orange, N. J. Comprises transcribing device at receiving station, and answer back.

1,194,281. Electric Circuit-Controlling Device. S. E. Doane, assignor to General Electric Co. Modification of No. 1,194,194.

1,194,302. Music Recorder. B. F. Liefield, Los Angeles, Cal. Has electromagnetically operated tone-recording means.

1,194,313. Magneto-Ignition Device for Internal-Combustion Engines. A. F. Payne, Harbone, Birmingham, England Details of contact-breaker.

1,194,324. Circuit-Closer. A. E. Williams, assignor to Electric Liquid Operator Co., Jersey City, N. J. Controlled by liquid in tank, for controlling pump motor.

1,194,339. Telephone-Exchange System. T. G. Martin, assignor to First Trust & Savings Bank, Chicago, Ill. Arrangement of busy signals, etc., in common-battery system having common ringing generator.

1,194,343. Electric Heater. H. W. Denhard, assignor to Cutler-Hammer Mfg. Co. Details of toaster.

1,194,345. Electric Switch. C. J. Klein, assignor to Cutler Hammer Mfg. Co. Two-push-button, pendent switch.

PATENTS EXPIRED.

The following United States electrical patents expired August 15, 1916:

630,840. Apparatus for Measuring Electric Currents. H. Aron, Berlin, Germany.

630,841. Combined Telegraph and Telephone. R. M. Bailey, Williamsport, Pa.

630,852. Locking Hanger for Electric Arc-Lamps. J. A. Brennan, Worcester, Mass.

630,857. Alarm Device. W. C. Brumder and J. Rogginger, Milwaukee, Wis.

630,905. Electric Arc-Lamp. P. Luhr, Orange, N. J.

630,927. Surface-Contact Railway System. W. B. Potter, Schenectady, N. Y.

630,930. Armature. H. G. Reist, Schenectady, N. Y.

630,938. Controlling Mechanism for Electric Railways. S. H. Short, Cleveland, O.

630,939. Controlling Mechanism for Electric Railway-Cars. S. H. Short, Cleveland, O.

630,953. Automatic Regulator for Electric Currents. A. Vogt, Budapest, Austria-Hungary.

630,966. Carbide Furnace. L. K. Bohm, New York, N. Y.

630,974. Electric Block-Signaling Apparatus. H. H. Creamer, Millbury, Mass.

630,997. Apparatus for Exhausting Electric Lamps. W. F. Smith, Philadelphia, Pa.

631,015. Electric-Railway System. J. G. Justin, Syracuse, N. Y.

631,023. Telephone-Toll Apparatus. M. C. Mengis, Baltimore, Md.

631,024. Mechanical Depository. M. C. Mengis, New York, N. Y.

631,032. Electric Alarm and Registering or Controlling Apparatus. M. Vester, Leipsic, Germany.

631,037. Electric Appliance for Controlling Supply of Gas to Burners, etc. C. Franzen, Cologne, Germany.

631,040. Process of Extracting Precious Metals from Their Ores. J. E. Greenawalt, Denver, Col.

631,044. Standard Voltaic Cell. R. O. Heinrich, Berlin, Germany.

631,055. Electric Arc-Lamp. C. J. Toering, Philadelphia, Pa.

631,070. Sound-Locating Device. A. M. Goodwin, Waltham, Mass.

631,073. Contact System for Electric Railways. W. Grunow, Jr., Bridgeport, Conn.

631,081. Mouthpiece for Telephones. A. Laemmel, New York, N. Y.

631,112. Electrician's Tool. D. S. Geiser, Waynesborough, Pa.

631,132. Telegraph Switchboard. J. F. Skirrow, East Orange, N. J.

631,134. Electrically Operated Railway-Crossing Alarm. J. E. Steele, Columbus, O.

631,145. Electric Safety Appliance. F. H. Badger and W. J. Plews, Montreal, Canada.

631,150. Telephone Circuit. H. Brockelt, Dresden, Germany.

631,162. Electrically Operated Cock and Ignition Device. P. L. Guyenot, Paris, France.

631,165. Trolley, H. Hirschman. Salt Lake City, Utah.

631,167. Telephone System. M. S. Keys and J. H. Spencer, New York, N. Y.

631,173. Attaching Plug for Flexible-Wire Connections. D. McGlone, New York, N. Y.

631,191. Storage-Battery Cell. A. K. Westerdahl, New York, N. Y.

631,221. Incandescent Lamp. E. C. de Marcay, Paris, France.

631,222. Submarine Photographic Camera. D. Mason, New York, N. Y.

631,225. Electric Meter. G. F. Packard, Fort Wayne, Ind.

631,234. Cleat for Electric Wiring. H. M. Stevens, Boston, Mass.

631,238. Motor Apparatus. J. E. Taylor, Roxobel, N. C.

631,253. Process for Reducing Aluminum. F. A. Gooch, New Haven, Conn.

631,263. Electrically Operated Gate Valve. L. E. Walkins, Springeld, Mass.

Reissue 11,765. Controller for Electric Lights. O. M. Lacey, Hanford, Cal.

Design 31,410. Snap Switch-Button. C. G. Perkins, Hartford, Conn.